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VIEWS, NEWS AND INTERVIEWS.

A French electrical paper recently mentioned an instance of great presence of mind on the part of a Frenchman traveling in a New York electric cab. The cab suddenly stopped, and one of the occupants—a cool-headed engineer—investigated the cause and found that the fuse had blown. It was the work of an instant to take a tablet of chocolate out of his pocket, remove the tinfoil in which it was wrapped and connect it in place of the fuse, so as to allow the cab to proceed blithely on its way again.

It is expected that during the construction of the second circuit on the Niagara Falls–Buffalo electric transmission line, the present circuit now in service will be shut down for about 30 days.

The big power-house of the Capital Traction Company at Washington, D. C., was totally destroyed by fire on September 29 and all the company's cable cars were thrown out of service. The next day the company was compelled to resort to horse and mule-power to draw the cars, and every animal available was purchased and pressed into service. The loss to the traction company on the building and machinery is estimated by officials of the road to be $400,000. The insurance amounts to $250,000. Other losses will make the total more than $600,000.

"I am one of your co-efficients," remarked Dr. Louis Duncan, the brilliant young scientist of Johns Hopkins University, to Lord Kelvin, of the chair of Natural Philosophy of Glasgow (Scotland) University, when introduced at Schenectady last week. Lord Kelvin's notebook and pencil were at once brought into service.

"This new ocean greyhound, the 'Wilhelm der Grosse,' is a wonder," observed the man with the bulging forehead. "On her first voyage across she made a day's run of 564 knots and developed 30,000 horsepower in her engines. Let's see; that would be enough power to supply nearly 400,000 16-candle-power incandescent or 30,000 arc lights, wouldn't it?"

A correspondent of the Westminster *Gazette*, writing of a distorted French telegram, tells a story which he got from Lord Onslow on his return from New Zealand: "Many years ago Mr. Gladstone, speaking of Mr. Parnell, made use of the oft-quoted phrase, 'Marching through rapine to the dismemberment of the empire.' On the same day there was a horse race, in which the winners were, respectively, Veracity, Tyrone and Lobster. These facts were cabled to New Zealand together in the usual shorthand style of the cable. The result was that the next day the New Zealand papers contained the following extraordinary paragraph: 'Mr. Gladstone denounced Mr. Parnell as marching through rapine to the dismemberment of the empire, and said that the Irish leader had the veracity of a Tyrone lobster.'"

A London cablegram states that the Icelandic Parliament having voted a subsidy for the purpose, the Great Northern Telegraph Company will, during the early Summer next year, lay a cable from Scotland to Iceland, by way of the Faroe Islands. It is said that Great Britain will make cable connection from Iceland to British America.

Before the Engineers' Club, of Philadelphia, recently, Charles F. Scott tried to find a homely illustration of what the 6,000,000 horsepower that might be developed by Niagara Falls represented. He did it in this way: "Suppose pumps be placed below the falls for pumping the water up again to its former level. If a man exerted a force of about 20 pounds per stroke and worked at a fair rate for eight hours per day, it would take about ten times the total population of the United States to pump the water back as fast as it is flowing over the falls. Consider for a moment what this means. If 70,000,000 of us were engaged in manual labor, all the work we would do could be accomplished ten times over by the power which is now going to waste. All the work of laborers, all our actual exertions in digging, hammering, lifting, climbing stairs, running sewing machines or riding bicycles, probably does not represent the one-hundredth part of this stupendous power."

The scientific department of Yale, officially known as the Sheffield Scientific School, will be just half a century old this month. The directors will hold a celebration in honor of the event on October 28. It is expected that Daniel C. Gilman, president of Johns Hopkins University, will deliver the chief address.

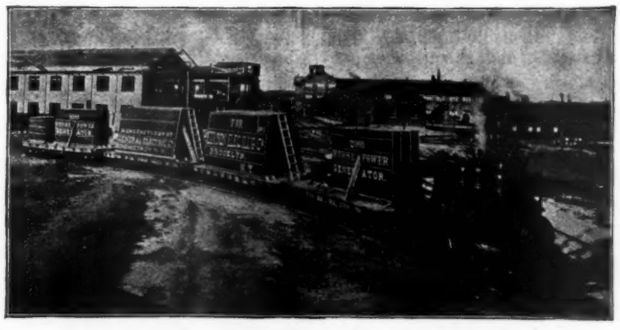

Fig. 1.—A Monster Generator in Course of Transportation on Four Flat Cars.

A Monster Generator.

The great three-phase alternating-current dynamo, intended for the new station of the Edison Electric Illuminating Company of Brooklyn, N. Y., has been shipped from the works of the General Electric Company, Schenectady, N. Y. To transport this exceptional generator to its destination, not less than five flat freight cars were needed, and Fig. 1 shows the train with four of them being hauled by the General Electric switching engine to the tracks of the New York Central Railroad.

The generator is rated as A. P. 40–1500–75; that is, it is an alternating-current, three-phase machine of the revolving field type, with 40 poles and a normal output of 1,500 kilowatts when running at 75 revolutions. In designing this, the instructions, so far as cost and expense of operation, were duly considered in relation to the conditions of service, but the design was left entirely to the General Electric Company. The machine which has resulted would, under ordinary conditions, be considered one of 2,000 kilowatts. In use it will be driven directly by an engine giving its highest economy at a little over 1,500 kilowatts, or which can be operated to advantage, and will probably be operated at an output of 2,000 kilowatts. The engine selected is a four-cylinder, triple-expansion engine, built by the McIntosh & Seymour company.

The dynamo is wound for an output of 2,000 kilowatts at 6,600 volts. The armature windings are mounted upon the stationary part of the machine, shown in Fig. 2. These windings form one of the most interesting features of the construction of this class of machine, the method of coil construction and insulation being especially adapted to high-voltage work. The armature frame is built to give perfect ventilation to the windings, and the machine is guaranteed to operate continually with a heavy overload with only very moderate heating.

The field structure is built upon a cast-iron spider, with a steel ring bolted to the ends of the spokes. To

this ring are bolted 40 field-pole pieces, each built up of carefully annealed sheet-iron laminations. Each pole-piece carries a coil made up of heavy copper strip wound on edge. All these coils are connected in series, the direct current used for excitation being carried through them. This field structure will be mounted on the steel shaft, 27 inches in diameter, of the triple-expansion engine. On the same shaft are the engine cranks and a heavy flywheel, of such weight that the angular variation of speed within each revolution at full load can not exceed one-quarter of one per cent.

The armature structure will be supported on rails, instead of a masonry foundation. This allows the armature to be moved along the rails away from the field, giving easy access to both field coils and armature winding.

The size of this machine, and incidentally the range of the dynamo and motor work of the General Electric Company, may be gauged from the illustration, Fig. 3, which shows standing beside the armature frame a General Electric induction motor of one-half horse-power capacity. The dimensions of the generator are as follows:

Span of casting of lower half of armature frame	25 feet
Vertical outside diameter of armature frame	31 feet 2 inches
Length along shaft	51 inches
Weight of revolving field	59,000 pounds
Total weight	163,000 pounds

This machine is destined for the new station of the Edison Electric Illuminating Company, situated at Bay Ridge, at the entrance to the narrows of New York Harbor on the Long Island side. It will deliver the high-potential, three-phase current to a system of conductors over which it will be distributed at different voltages for many purposes. The territory over which the Brooklyn company is preparing to operate covers over 75 miles; and by the use of a great central station at tide-water, with substations at convenient points, the company proposes to distribute current over this vast section. A large portion of the current will be transformed down to 375 volts, and then, fed to rotary converters, will be distributed as low voltage direct-current to the Edison three-wire system now receiving current from the stations already in operation. A part of the high-potential current will be used to drive synchronous motors directly coupled to arc machines, as well as to drive other motors for various power purposes. With this source of power supply at their doors, it is expected that the present users of steam-power in Brooklyn will avail themselves of the cleaner and more flexible system to drive, which the electric current offers.

The Englewood & Chicago, Ill., Electric Street Railroad will be sold at a judicial sale October 12 at the Cook County courthouse. Official announcement of this will be made shortly. The upset price is to be $250,000. This is quite low, but the property is expected to be bought in by inside interests.

Boston Edison Company Contracts for a Fifth Storage Battery Plant.

The Electric Storage Battery Company has closed a contract with the Edison Electric Illuminating Company of Boston for a battery of chloride accumulators. This will make the fifth battery in the service of the Boston Edison company.

Contracts have also been recently closed for central station batteries with the Cleveland Electric Illuminating Company and the Richmond, Va., Railway and Electric Company, and for batteries for regulation on trolley roads with the Central Railway Company, of Baltimore, and the Potomac Electric Power Company, of Washington. The Potomac company has been operating a battery of chloride accumulators for about a year. A battery is also being installed on the lines of the Barre & Montpelier Electric Railway, Montpelier, Vt.

Chloride accumulators are being installed in the Reading Terminal Station in Philadelphia to carry the peak of the load and to furnish current for the lamps burned during the early hours of the morning.

A battery is being installed in the new library building of Princeton University. This battery is to be charged by the town plant between dusk and midnight, and during other hours will furnish the current required for the lamps and for operating three ventilating motors, two elevators and one book-lift. The government has recently contracted for a battery for lighting work at David's Island, and has also ordered something over 1,000 cells to be distributed at some twenty odd points for coast defence work.

Chloride accumulators have been installed in the residence of Mr. S. S. Childe, Basking Ridge, N. J., where they are being operated in connection with a gas engine-dynamo plant. D. S. Brown & Company, New York, are installing chloride accumulators for night lighting in their new factory.

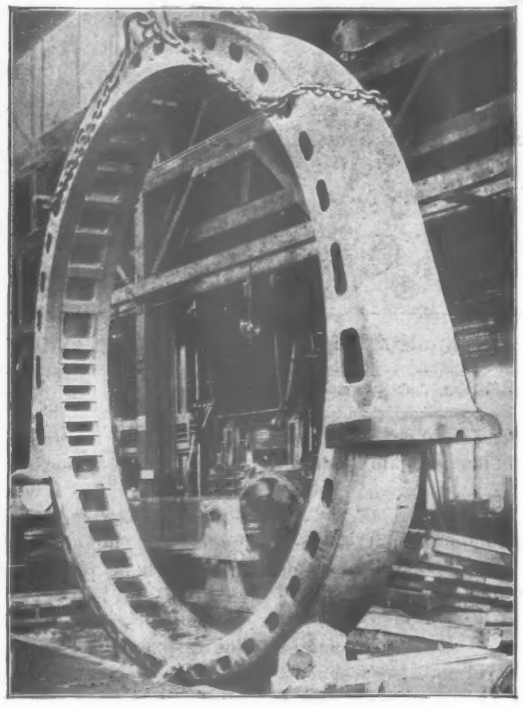

FIG. 2.—STATIONARY PART OF THE BROOKLYN EDISON COMPANY'S MONSTER GENERATOR.

FIG. 3.—CAST-IRON SPIDER OF THE BROOKLYN EDISON COMPANY'S MONSTER GENERATOR.

BOOK NOTICES.

Messrs. Norman W. Henley & Company have published a new, revised and enlarged edition of the "Standard Electrical Dictionary," by Prof. T. O'Conor Sloane. This valuable work is bound in cloth, consists of 624 pages, containing 350 illustrations, and is supplied by the ELECTRICAL REVIEW, Times Building, New York, postage free, on receipt of $3. One of the many valuable features which it possesses is that there is a complete system of synonyms of terms wherever required. It is especially valuable to a student, not only as a dictionary, but as a reference handbook.

"AMERICAN AND OTHER MACHINERY ABROAD," by Fred J. Miller; 90 pages, illustrated, bound in flexible canvas; price, 50 cents. Sent, postage free, on receipt of price, by ELECTRICAL REVIEW, Times Building, New York city.

Mr. Miller, who is the editor of the *American Machinist*, recently spent some time abroad studying the European field for the introduction of American machinery. The result of this study he embodied in a series of letters to the *American Machinist*. The interest taken in them by readers on both sides the Atlantic has caused a demand for their publication in book form. The author states that he has made an attempt to show something of how foreign workshops are conducted, how work is done in them, and especially what conditions American tools, now going abroad in such large numbers, have to meet in foreign lands. Mr. Miller is a competent and keen observer, and has described what he has seen in an agreeable and interesting manner. While his book appeals primarily to machinists and manufacturers of machinery, yet the electrical manufacturer will find much to interest and instruct him between the covers of this little work.

Canada Gets Long-Distance Telephone Service.

The New England Telephone Company has been at work for some time with the view of establishing long-distance service between Boston and points in Canada, connecting with the wires of the Canadian Bell Telephone Company. The long-distance service of the New England company extends only to St. Albans, Vt., but in order to make a perfected service, heavy gauge wires were strung from Greenfield, Mass., to St. Armand, P. Q., where the lines of the Bell company have been met. On September 27 the preliminary test was made of the new service by President Sherwin of the New England company and President Hudson of the American Bell company in the Boston office, who exchanged congratulations with President Sise, of the Canadian Bell company, in Montreal. The service was perfect, and later Quebec and Toronto were connected, and the service found equally as good as with Montreal. The distance between Boston and Toronto is 800 miles, and the service is as good as that of any line for an equal distance. The service is now open for public use, and commercial service, between persons having long-distance equipment is possible between Boston, and other New England points, and Montreal, Quebec and Toronto and other Canadian cities.

The Smith-Vassar Telephone System.

A new telephone system, illustrated herewith, which is the development of some years of experiment by the Smith-Vassar company, of New York, is about to be offered to the public. The feature of the apparatus is that it affords economical service for local telephony.

The object, as the officers of the company explain, is not to exploit any new theories of electricity, but to so employ established principles as to bring about a radical change in method, adopting a system of individual signaling, with the idea of avoiding the expense of general offices. "In doing this," Mr. James G. Smith, the inventor of the system, says: "we aim to do away with the use of synchronous acting mechanisms and other complicated step-by-step devices, and more especially the accumulation of resistance when introducing a large number of stations in the line. The next important requisite was to prevent the great waste of

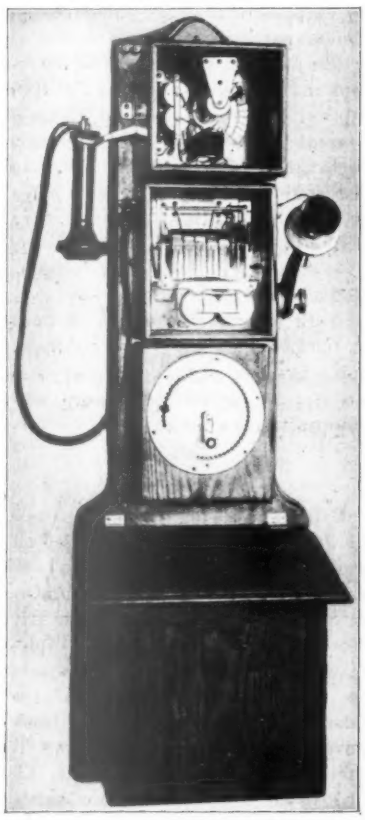

FIG. 1.—THE SMITH-VASSAR TELEPHONE.

wire made necessary by the present system.

"The Smith-Vassar company has finally succeeded in accomplishing this result, and it is now completing the tools, to be ready for the speedy manufacture of its instruments in large quantities. These instruments as finally devised are simple and very easy to manipulate, the subscriber merely turning a switch to the number required and taking down his 'phone from the hook. By doing this he not only selects and rings up the desired party without the knowledge of any other person on the line, either intermediate or beyond, but he also completes and holds a metallic circuit exclusively for himself and his correspondent until they get through talking, the system enabling other pairs of subscribers to correspond in a like exclusive fashion over other wires while the first pair are doing so over the first wire. The number of wires actually required, however, is equivalent only to the average number of pairs of people who might desire to operate at the same moment in any one section of the system.

"In small towns and villages the whole can be accommodated on one section without any central office. In larger towns and in cities the system would be divided into sections having such a number of subscribers on each section as would correspond to the active character of their business. In a city where 2,000 subscribers were obtained, 20 sections might be necessary, and a small central would be established, where the duty of the one operator (or possibly two) would be only to connect sections as the subscribers on any one section would not, of course, be obliged to resort to a central office, except for subscribers outside of their section. It will be at once seen that a system operated in this manner would cause a great reduction in expense at the central point, besides relieving central of so much work that whatever is done there can be done promptly. The reduction of such expenses, coupled with reduction in cost of maintenance (the latter forming a large proportion of the expenses of the present system), would effect so large a saving as very materially to reduce the price at which 'phone service can be rendered to the public, and adding greatly at the same time to its promptness and efficiency.

"As an example of the difference in the cost of maintenance of a line, 5,000 subscribers under the present system would require 10,000 wires to run into the central office, while under this new system, less than 600 wires will furnish the same service, with much greater promptness; in other words, fully 50 per cent of the wires put up under the present system are necessarily idle the greater part of the time, whereas the new system renders the same service upon a far less number of wires constantly in use. Another feature of this system, important to those living in towns and villages between cities, is that a large number of stations situated at a considerable distance apart can be furnished with private communication with each other and with neighboring towns over a limited number of wires, and extending over hundreds of miles, without intervention of exchanges or central offices.

"It is well known that under the present system of public telephones, if eight or ten stations were placed on the same line, it would be necessary

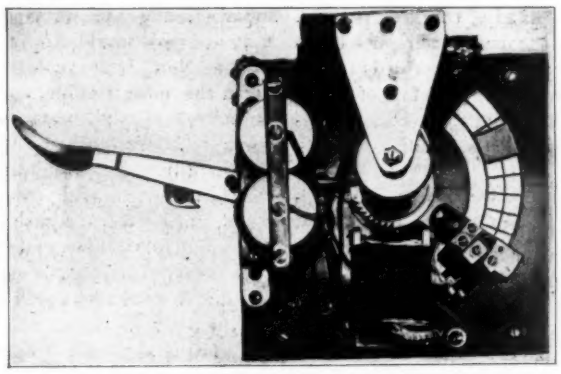

FIG. 2.—SMITH-VASSAR TELEPHONE LINE SWITCH.

to arrange a system of signals for each station, and all these signals would necessarily be rung at every office on the line every time anybody was called. But in this new system, with hundreds (possibly) placed upon the same line, any one of the subscribers can call any other in an absolutely private manner.

"The system can be worked over as great a distance as the ordinary Morse telegraph, and has this advantage over even the telegraph; namely, that the locating of hundreds of instruments upon the line does not affect the distance over which signaling and 'phoning can be effected. New York and Chicago would work together with the same faculty whether there were 500 stations between, or none at all."

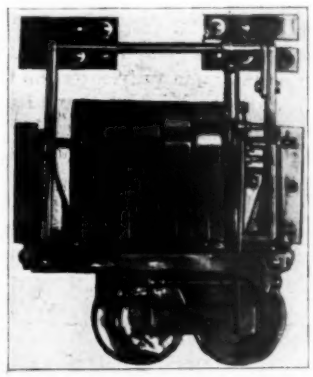

FIG. 3.—SMITH-VASSAR CONTACT CYLINDER.

As will be seen in the illustration, the switch is on the instrument, and to call a subscriber it is only necessary to put a plug in the hole corresponding to the subscriber's number and turn the switch without disturbing the bells of any of the other subscribers on the line.

The officers of the company are Messrs. F. S. Pusey, president; John G. Dorrance, vice-president and general manager; R. G. Vassar, secretary and treasurer; James G. Smith, electrical engineer. The directors of the company are Messrs. John G. Dorrance, Edgar C. Moxham, James F. Pierce, Ernest Thalmann, R. G. Vassar, George M. Hard, Herman W. Williams, William R. Dumond and Robert S. Masterton.

The Storage Battery Situation.

The New York daily papers recently called attention to the fact that Mr. John Jacob Astor and Dr. W. Seward Webb had withdrawn from the Samuels Dynamic Accumulator Company, 131 Liberty street, New York city, because the storage battery made by the company was not a success. Some of the papers published articles containing misinformation on the subject of storage batteries in general. With a desire to give a correct idea of the storage battery situation as it exists to-day, Mr. Charles Blizard, New York manager for the Electric Storage Battery Company, addressed a communication to the New York *Commercial Advertiser*, from which we quote the following:

While it is true that the Samuels battery has failed to realize the expectations of its inventor, that has been the case with a great many types of batteries, and does not affect the fact that other types have proven a marked success.

That Mr. John Jacob Astor, notwithstanding his experience with the Samuels battery, has not lost confidence in storage batteries in general, is proven by the fact that the Progreso and the Utopian, the boats from which the Samuels batteries were removed, are now equipped with chloride accumulators, which have proven notably satisfactory. Another instance, to prove this statement, is the fact that the electrical equipment of the new hotel, the Astoria, belonging to Mr. Astor, includes a large battery of chloride accumulators.

The unsatisfactory results obtained from the Samuels cell in train lighting proves nothing more than a failure of that make of cell to meet the requirements. The chloride accumulator has been in successful service for over two years on the Inter-Colonial Railway, of Canada, on the Union Pacific, and notably on the Pennsylvania Limited between New York and Chicago. Moreover, the Atchison, Topeka & Santa Fé Railroad Company is now equipping 50 of its coaches with an electric lighting system, in which chloride accumulators play an important part.

As for the statements made in respect to storage battery traction, which is pronounced to be impracticable, the very contrary is proven by the fact that in the case cited, namely, the city of Paris, 35 new cars are now being added to the storage battery system in that city. In Germany storage batteries for traction purposes are rapidly coming to the front. The city of Hanover has in operation over 160 cars; the city of Dresden is equipped with storage battery cars, as are also Frankfort, Copenhagen, in Denmark, and other cities. The most notable advance in this direction has just been made by the city of Berlin, where 900 cars are being equipped with storage batteries.

In America the city of Chicago has a line 12 miles long, equipped entirely with storage-battery cars, the operation of which is pronounced perfect by all those who have investigated it.

Many of the largest buildings of New York are equipped or are being equipped with storage batteries, as, for example, the Commercial Cable Building, the Queens Insurane Building, the Mohawk Building, the United States Custom House, the new Criminal Court Building, the Astoria, etc., and the Edison Electric Illuminating Company is operating two large storage battery stations.

THE TELEPHONE IN THE LIFE-SAVING SERVICE.

A VALUABLE ADJUNCT IN THE SAVING OF LIFE AND PROPERTY.

To the Editor of Electrical Review:

The total mileage of life-saving telephone lines is nearly 1,000 miles, and there are more than 200 telephone connections at life-saving stations, half-way places, lighthouses, and other points in connection with the service, covering the Atlantic coast from Maine to Hatteras Inlet, N. C., including the islands of Martha's Vineyard and Nantucket, Mass., Block Island and Rhode Island, with local telephones at Jupiter, Fla.

The following points on the Pacific coast are connected with San Francisco, Cal.: Fort Point Life-Saving Station, Fort Point Lookout, Fort Point Boat-House, Long Beach; Point Lobos Lookout, Golden Gate Park Life-Saving Station, Golden Gate Park Lookout and the South Side Life-Saving Station.

On the Great Lakes, the Big Sandy Life-Saving Station, Lake Ontario, is connected with Woodville, N. Y.; Vermilion Point, Crisps, Two Heart River and the Muskallonge Lake Life-Saving Stations, in Michigan, on Lake Superior, are connected, as also are Point Betsie, Old Chicago and South Chicago, Ill., on Lake Michigan.

At some points on the coast of Cape Cod, the half-way places are connected by telephone with the main line. We use the term "half way" to designate a place about midway between two life-saving stations, where the patrols meet and exchange checks during the night watches. The object in connecting the half-way places is to enable the patrols to send in an alarm of wreck or report vessels that may be in distress in the vicinity of the half-way place, without having to run back through miles of loose sand, and perhaps in the face of a gale, to notify their respective stations, as in the old days.

We use the American Bell telephones, mostly the pattern known as the solid-back transmitters, and the ordinary receivers. We have in use three patterns of magneto call-bells, the 1,000-ohm Chicago Bridging bell, the 80-ohm Chicago Nos. 1 and 2. We find the No. 2 the best for the salt air, but it is not so hard a ringer as No. 1.

Our telephones are connected in series. We use grounded circuit, metallic circuit, and a combination of both; in short, whatever system will work best with the least expense. We have been using No. 9 galvanized iron wire, but of late years this is being replaced by No. 10 copper.

The life-saving telephones are utilized to facilitate the transaction of all sorts of official business from the smallest fair-weather, every-day affair to the stranding of a full-rigged ship in the midst of the tempest. It takes part in everything relating to the saving of life and property. It brings a number of stations in close touch, affords co-operation, and where needed several crews can be,and often are, massed together very quickly. I have seen four crews at a wreck where the terrible sea and current gave all hands plenty of work.

The telephone often transmits the announcement, "Ship ashore! Bring breeches buoy and gun immediately." I have heard many such calls and witnessed many thrilling rescues where a demand of this kind is made. It feels like going to a fire or a burning building where imperilled inmates are to be rescued. The fate of a man on a wreck during a gale is as precarious as that of a man in a burning building.

The telephone is also used in calling tugs to go to vessels in distress at sea, to notify owners and underwriters of disasters, to watch disabled vessels, and in isolated places to call up a physician or substitute patrols in cases of sickness, etc. Every section is connected with some telephone office where telegrams can be sent and received.

The telephone lines in North Carolina have connection with the telegraph offices at Hatteras and Cape Henry. In upper Virginia and lower Maryland and Delaware there is telegraph connection at Lewes, Del., and Cape Charles, Va. In New Jersey at Atlantic City and Sandy Hook. On Long Island there is connection at Fire Island, and the same is true of all other sections. The Massachusetts lines are connected at Chatham, the Highlands and Provincetown.

Vessels at sea, within signal distance of a life-saving station, can send messages by the international code to the nearest station, and in turn the station can send it by telephone to a telegraph office.

The telephone system was first adopted about 18 years ago in North Carolina. The ground circuit in use then on that line fully covers all the needs of the service to-day, and there is no induction on the 160 miles of line from Cape Henry, Va., to Hatteras Inlet, N. C. This line is connected in series; the 160 miles of line are divided into three sections, with extension bells and switches (sliding switches). Most of the call bells are Chicago No. 2. We find that the bells will ring 55 miles, with nine bells in each section, and give entire satisfaction.

The line from Lewes, Del., to Cape Charles, Va., is similar to the North Carolina line. It is 140 miles in length, connected in series, has two switches and extension bells. There are about eight miles of submarine cable in this section. The beaches are low, many of them being entirely covered by water during storm tides. There are a good many Blake transmitters still on the line, but they are being replaced by the solid backs. Where the needs of service require it, the wire in these sections is one No. 9 ground circuit. We are replacing the galvanized by No. 10 copper whenever new wire is necessary.

We use 23-foot white cedar or chestnut poles, about four and one-half inches at tops. We sharpen the butts wedge fashion and surge them down five or six feet. A pole put down this way will never wash up, except where the sea cuts away the ground from under it. Before resorting to this method we tried putting poles down in the old way—that is, "flat-footed." We even used an iron cylinder as a caisson to dig the holes in, but during the prevalence of storm tides the beaches got soft, the sand loosened, and the water under the flattened pole would lift it up.

The New Jersey coast line has given the most trouble, and we have not driven all the noises out of the wires yet. We worked this section successfully as a grounded circuit with the instruments connected in series, until electric light and trolley wires multiplied here and there, and almost everywhere, and confused the telephones until they could not speak for themselves.

As fast as electric currents were introduced we doubled our wires, using a pair of No. 10 coppers. The New Jersey line now has copper metallic circuits from Sandy Hook to Bay Head and from Atlantic City to Cape May, leaving 55 miles of ground circuit between Atlantic City and Bay Head. There are no electric plants along the route of the ground circuit, and we are now trying to work it as a combination of metallic and ground circuit by the use of extension bells, switches and repeating coils at Atlantic City and Bay Head.

We use 1,000-ohm bells bridged in the metallic and 80-ohm bells looped in the ground circuit. Much trouble was experienced with the bridging bells burning out by lightning. We use three-tenths ampere lead fuse-wire and a disk lightning arrester for each bell. Finding that the lightning would run over the short fuse, I made some fuses 10 inches in length, and never have had an instrument burn out since using these. We had also a good many cases of armatures or spools burning out. We generally make our own repairs, and when an instrument is burned out we put in new parts or repair the damaged ones. Linemen's work on the coast is not a pleasant duty, the trips being long, with dangerous inlets to be crossed, and there is but little shelter on the beaches in stormy weather. It may be of interest to many to know that one man has charge of the 160 miles in North Carolina. Trips are mostly made on muleback.

Yours truly,

William Bolton,
Superintendent Telephone Lines Life-Saving Service.
Long Branch, N. J., September 30.

Suit has been entered against the town of Hampton, Va., to the amount of $25,000 by the Hampton Electric Light and Power Company. The company claims damages done by the town in 1892, when a number of their poles were cut down in the city limits. The town claims that the Electric Light and Power Company forfeited its charter by failing to keep up the candle-power of its lights.

The Carrollton Electric Railway Company, of Carrollton, Mo., capital stock, $10,000; incorporated by F. V. Crouch, J. L. Mimmies, F. L. O'Leary and George S. Grover.

General Electric Company's Foreign Business.

The British Thomson-Houston company, of London, through its representative, Mr. A. K. Baylor, has just closed an important electric railway contract with the companies operating the tramway systems of Dublin, Ireland, and Barcelona and Madrid, Spain. The contract for Dublin includes all steam, as well as the electric generating and motor equipment, and comprises six Allis horizontal engines of 500-horse-power each, with Babcock & Wilcox boiler capacity necessary; six 500-kilowatt, multipolar General Electric generators for direct connection to the engines, and complete switchboard and station equipment. The car equipment will consist of 150 complete motor and series parallel controller equipments, the motors to be mounted on Peckham trucks. This contract follows closely that made for the equipment of the Clontarf line of the Dublin tramway system, which will be opened within the next week or two. The apparatus for this was also supplied by the British Thomson-Houston company.

The contract signed for the Barcelona and Madrid roads covers five 400-kilowatt multipolar General Electric generators, and three of 75 kilowatts each, all to be directly connected to the engine shaft. While the three latter will be lighting generators, they will also be wound for 500 volts. This contract also includes full station equipment.

Work will be commenced at once on the London underground contract, and it is expected that all the apparatus it calls for will be finished and shipped in nine months.

LITERARY.

Before and during the war in Greece no writer was so frequently quoted on the crisis as Henry Norman, of the London *Chronicle*. The October number of *Scribner's Magazine* contains Mr. Norman's inside history of the diplomacy that preceded the war, now told for the first time. He was in confidential relations with the Greek government, and his narrative is therefore of authoritative value. A visit to the front on the eve of battle is also picturesquely described. The illustrations are from Mr. Norman's own photographs, among them autographed portraits of the king and his sons.

"Man and the Machine" is the title of a striking article from the pen of the Rt. Rev. Henry C. Potter, D.D., Bishop of New York, in the *North American Review* for October, the bishop discussing, apart from other things, the tendency of the increased employment of machinery to mechanicalize the workman. No one, he asserts, can fail to perceive the enormous gains in convenience, comfort and luxury from the application of machinery to the arts. But the great gain is not without cost in many ways and of many kinds, and to the individual who works at a handicraft it is real and serious.

The National Telephone Association.

We have received an interesting communication from an esteemed contributor relating to the question of the safety of using telephones manufactured by the independent companies. The value of the various guarantees of the manufacturers is discussed, and the writer concludes as follows:

It was stated repeatedly at the convention in Detroit that the guarantees would not be sufficient protection for the companies in case of adverse litigation and that some different method must be devised for adequate protection. This class of men see clearly they must depend largely upon combined efforts and mutual defense in case of any substantial victory on the part of the Bell company. And for this purpose, primarily, the organization was formed. The wisest course which any independent company can pursue is to join the association and thereby obtain all the security possible. This whole movement has been commenced and is conducted in the interests of the local companies who are sustained by the people of the country, and the work will be of incalculable value if proper support is given to its officials. It is practically a mutual insurance company and the men at the head of it have shown, both at Detroit and since then, a desire to further its interests on the soundest possible basis and to the end that all may be fairly protected.

The Bell company own hundreds of patents, all of which are on file at Washington, and it is possible for you to know whether, outside of the Berliner question, which is now in litigation, you are free from infringements. It is possible for your apparatus to be clear, outside of this suit, and you should insist that your apparatus should be free in every feature by independent expert examination. The Bell company know exactly what you have. They employ agents to ascertain the exact condition of every plant in the country, and they come very near accomplishing their object. In case of their success in the Berliner suit, which is very improbable, it will not be necessary to go into minor litigation. If they lose, you will hear from them, provided there are infringements in your apparatus. Fancied security arising from negligence is suicidal. The people are behind this movement, and there are substantial profits in the telephone business if wisely managed. The ultimate success of the independent organization in this country depends largely on the business management and unselfish organization of its individual parts, and it is less than fair to expect any one manufacturer to fight a great battle in which the entire country should take part and is financially interested. Strengthen your defenses by careful selection of the best apparatus, free from infringements in all minor parts, and cordially, heartily sustain the national organization in its battle for your interest. The insurance is lower than you pay on other property, and you are far more dependent upon the results which this combination will effect. There is no cause for needless fear or refraining from pushing your business in the most enterprising manner, but in some cases companies have been organized and business has been conducted as though the telephone enterprise were a second Klondike, and it was simply necessary to purchase apparatus, install the same, and sit down to count your gains. The ablest financiers in the country are behind the Bell Telephone Company. Their guarantees to their licensed companies must be protected if possible, and their millions of property are to some degree at stake in this fight, and no stone will be left unturned to reach results, for which the best legal talent in this country, backed by unlimited resources, is being employed.

Good Advice to Subscribers.

[*From the Charleston, S. C., Cycle.*]

After you get angry and stop your paper, just poke your finger into water, pull it out, and look at the hole. Then you will know how sadly you are missed. A man who thinks a paper can not thrive without his support ought to go off and stay awhile. When he comes back half his friends will not know he has gone and the other half will not care, while the world at large kept no account of his movements. You will find things you can not indorse in every paper. The "Book of Books" is often very plain and hits some hard raps, but if you were to get mad and burn your Bible, the hundreds of presses would still go on printing it. So when you stop your paper and call the editor names, the paper will still be published, and what is more—you will read it on the sly.

It was reported last week that the Chicago City Railway officials have refused to entertain a proposition from the Elkins-Widener syndicate for the consolidation of all street railways in Chicago.

"Climax" Boilers in a Brooklyn Lighting Station.

The battery of boilers recently completed by the Clonbrock Boiler Works, of Brooklyn, N. Y., in the new plant of the Municipal Electric Light Company, at Rodney and Ainslie streets, Brooklyn, is worthy of note, as it shows well the advance in recent years in the construction of steam boiler apparatus. The plant consists of four 450 horse-power boilers of the standard type of Morrin "Climax." As the construction and erection have been carried out, space is planned for four more boilers of a similar size, which, it is believed, will be installed in the near future. Fig. 1 shows the plant as completed. Fig. 2 is published, as it shows excellently the two stages of construction of the "Climax" boiler and the method of arranging the tubes.

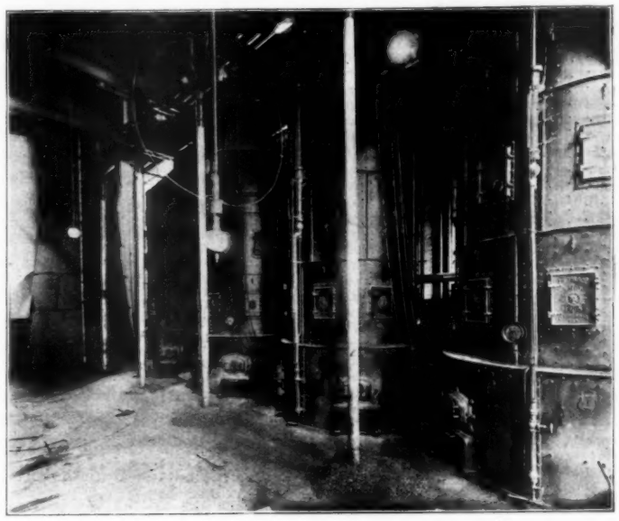

FIG. 1.—FOUR 450-HORSE-POWER MORRIN "CLIMAX" BOILERS IN THE PLANT OF THE MUNICIPAL ELECTRIC LIGHT COMPANY, BROOKLYN, N. Y.

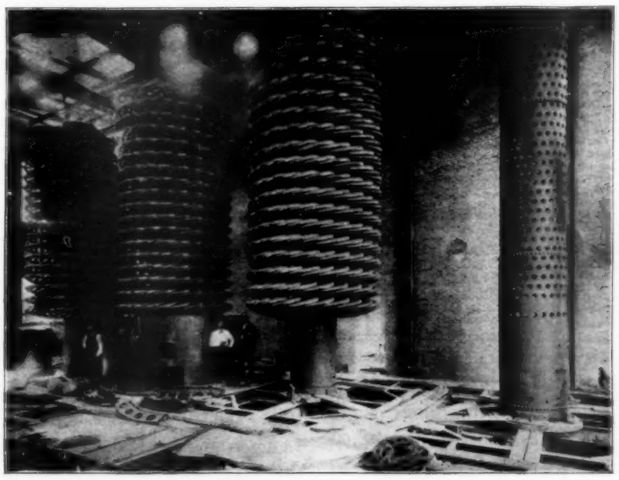

FIG. 2.—MORRIN "CLIMAX" BOILERS IN COURSE OF ERECTION.

In an examination of this installation, the features which have brought the "Climax" boiler into such universal use and adapting it particularly for electrical service are the facts that it has neither screw joints, metal joints, packing joints, cast-iron pipes, manifolds nor headers to cause trouble from unequal expansion and contraction, with no large diameters exposed to pressure, resulting in causing the ultimate strength to be far in excess of the strains to which the metal is subjected. A salient feature, also, of this boiler plant is its compactness. The vent tubes and main shell are filled with water, and the heat circulates in the tubes around the outer shell and vents of the flume, giving a very large heating surface in a small space. This method is thought to absorb the greatest amount of heat before it reaches the stack, and so lessens losses from radiation. The smoke-stacks used in the plant are made by the Clonbrock company, 175 feet in height, with a diameter of 16 feet at base and 11 feet at the top.

Chicago Electrical Association.

The following is the Fall and Winter programme for 1897–98 of the Chicago Electrical Association:

October 1—"Economy in Electric Car Control," James R. Cravath, of Cravath Manufacturing Company.

October 15—"Evolution of the Isolated Electric Plant," Harold Almert, electrical engineer.

November 5—"The Safe Current Capacity of Electrical Conductors," C. H. Sewall, of John A. Roebling's Sons Company.

November 19—"Daily Mathematical Conveniences," S. G. McMeen, engineer, Central Union Telephone Company.

December 3—"Heavy Electric Traction," Cloyd Marshall, electrical editor *Street Railway Review*.

December 17—"Electricity in Ship Building," C. C. Mattison, of Chicago Ship Building Company.

January 7—"Electrical Shop Transmission," H. G. Dimmick, of Western Electric Company.

January 21—"The Art of Constructing Telephone Apparatus," Henry P. Clausen, electrician, Western Telephone Construction Company.

The meetings of the association are held at 1737 Monadnock Building. Mr. J. R. Cravath, 825 Monadnock Building, is secretary of the association.

A Present Phase of the New Patent Law.

TO THE EDITOR OF ELECTRICAL REVIEW:

Owners of foreign patents on inventions not yet patented in the United States may be interested in the following statement, which I formulated, with the new statute as a basis, and forwarded to my foreign associates:

"You should advise your clients to proceed immediately to apply for valid United States patents for valuable inventions already patented in a country foreign to the United States; for after December 31, 1897, only seven months will be allowed after filing the application in said foreign country. A copy of the new law will be sent on request."

EDWARD P. THOMPSON.

New York, October 1.

It was announced on Monday of last week that the Hoffman House, of New York, of which Mr. R. T. McDonald, of the Fort Wayne Electric Corporation, is one of the proprietors, had again changed its ownership, Mr. E. S. Stokes retiring on account of ill health. The proprietors are now said to be R. T. McDonald, James D. Leary, J. P. Cadigan and Graham Polley.

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, OCT. 6, 1897.

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New York city may have been considerably behind in adopting electric traction, but when things got to moving, they moved. Over 6,000 men are at work on the new underground trolley lines.

The burning of the big cable powerhouse in Washington, D. C., last week gives the Capitol Traction Company an opportunity to rebuild its plant on modern lines and to adopt electricity as a motive power. In the mean time, if a temporary plant is installed, there are several electric companies in Washington which can supply current for running it.

We call the attention of our readers to a very interesting article in this issue of the ELECTRICAL REVIEW on the telephone system of the government life-saving service. Mr. William Bolton, who writes the article, is the superintendent of the system, and is therefore able to speak with authority on this very important aid to the salvage of life and property in danger along our coasts.

The business of the Edison Electric Illuminating Company of New York has acquired such a swinging gait of progress that for some months past the column headed "decrease" has been omitted from its tabulated monthly reports. There is nothing to record but "increase." This is a high tribute to the management and business policy of the company, and speaks well for the appreciation of its customers.

The electrical manufacturers report a constantly increasing demand for apparatus from foreign countries. This is especially true in the electric railway field. During the past week inquiries have been received from Russia, Japan, China, Buenos Ayres, Rio Janeiro and Berlin. This is a very encouraging sign of the times, and it is to be hoped that our manufacturers will take advantage of these inquiries to the fullest extent.

The London *Electrician* is apparently not a believer in Marconi and his system of telegraphy without wires. In a recent number, our British contemporary printed an abstract of Signor Marconi's master patent of 1896, and, as the "best antidote of Marconism," followed it with some photographs of apparatus publicly exhibited and fully described by Dr. Oliver Lodge in 1894, both at the Royal Institution and at the British Association meeting at Oxford. At the same time our contemporary refers its readers to Dr. Lodge's "Work of Hertz and Some of His Successors," wherein he who seeks will find all the law and prophets on the subject of Hertzian waves, their theory and their practical application. In describing Dr. Lodge's apparatus, the *Electrician* states that it constitutes a system of telegraphy substantially the same as that claimed in Marconi's patent. From our point of view, we think that an anecdote we printed several weeks ago is applicable to this case. This was to the effect that an old telegraph operator stated that he was afraid he would lose his job if this new wireless telegraphy came into use, as he had all he could do at the present time to telegraph with the aid of wires.

THE ELECTRICAL EXPOSITION.

As announced in the news columns of the ELECTRICAL REVIEW last week, the Electrical Exhibition Company, of New York city, has been formed by a number of gentlemen prominent in the electrical business, with the ultimate object of holding an electrical exposition in New York city during May, 1898. The exhibition company is formed thus far in advance in order to have ample time to prepare the preliminary plans for the show. The officers and management of the enterprise are such as to assure its success from the start. Ever since the first electrical show, held in New York city in 1896, there has been a demand among the electrical manufacturers for a repetition of the affair, as they all found that the exhibition of their wares under such auspices resulted in a substantial increase in their trade. It seems to be the general opinion that the show should be held in the Madison Square Garden, as many people consider this a more convenient location than the Grand Central Palace, where the former exhibition was held. This matter, however, has not yet been finally decided. We understand that the plans of the Electrical Exhibition Company include much that is novel and striking in the way of electrical effects and displays, and it is also understood that the enterprise will have the backing and support of some of the most influential and prominent commercial organizations in Greater New York. In addition to this, the electrical interests, as a whole, have extended their hearty support. From present indications the electrical exposition of 1898 should be a grand success, and we predict that such will be the case. The ELECTRICAL REVIEW extends to the gentlemen interested in the undertaking its cordial good wishes, and trusts that their expectations will be fully realized.

The London police are now wrestling with a question which involves the new electric cab service recently established in that city. Several accidents have occurred where the man in charge of the electric cab has been drunk and has allowed the cab to run amuck. The police say that they will guarantee to stop runaway horses attached to cabs, but they are unused to the peculiar actions of electric current and do not know just how to go about stopping a runaway electric cab. They hope to solve the question, however, by refusing to grant a license to a motor cab driver unless his employer will furnish a guarantee that he is a strictly temperate man.

The St. Lawrence Power Plant at Massena, N. Y.

To the Editor of Electrical Review:

The length of the canal to be dug by the St. Lawrence Power Company is about three miles. It varies in width from 200 to 400 feet and requires cutting through the earth from 35 feet to 95 feet in depth and means the moving of 8,000,000 cubic yards of material. The Lehigh Construction Company, of South Bethlehem, Pa., are the contractors for digging the canal and building the power-house, and they are going about it in a way more complete and better than ever attempted on similar work. They expect to work night and day, Summer and Winter, for two and one-half years to complete the canal, but they may find they can not work in the severest part of Winter on account of extreme cold, which sometimes reaches 40 degrees below zero.

The canal is several miles from the railroad, necessitating the construction company building and grading their own railroad, which in itself is quite a job, crossing as it does two rivers requiring heavy bridges. The railroad is standard gauge and will have new and heavy equipment. The camp of the construction company is the most substantial and complete ever built, consisting of some 25 or 30 large buildings for offices, etc., and including a most extensive repair and machine shop, forge and supply house. The buildings comprise company stores, an immense electric lighting plant with 60 arc and several hundred incandescent lights, boarding-houses for the men for first and second-class boarders, with an immense dining-hall that will seat at a time several thousand men, and an immense and finely equipped kitchen (and a *chef* late of the Fifth Avenue Hotel); also cold-storage warehouses of no small size. There is a bakery, a private dining-room for the officials, with private sideboard well supplied, private rooms for officials furnished beautifully, etc., etc. This camp is located midway along the canal.

The main office has a telephone system along the canal, with instruments convenient to the foreman of each gang, who can be immediately communicated with, saving much running about, and also connecting every building and department. There is, too, a Western Union private line telegraph in the office.

They are having eight of the biggest steam shovels ever built constructed for them by the Bucyrus Company. These shovels will each handle 1,500 yards in 10 hours, and with the ones they now have will make a steam shovel fleet of about 16 to 20 shovels. The various machine shops, forges, etc., will be run by electric motors from their power plant, but all the machinery at the power station end, used principally in the construction of the power station, will be run by compressed air. The material is principally soft white clay, and is easy digging. The task is a gigantic one, and I have no doubt the construction company will spend $150,000 on "rigging up" alone before starting the work.

Besides the railroad spoken of above, they have at least 20 small, narrow-gauge locomotives at work. They expect to handle the material entirely by power, not requiring so many men as a work where the material is shoveled. Mr. Duerr, the general manager of the construction company, is a very able and progressive man, and is the man who has outlined all the above. The English owners are on their way to this country now, and are expected at Massena with a big party this week.

Yours truly,

Traveler.

Massena, N. Y., September 30.

ELECTRIC RAILWAY NOTES.

The Milford, Holliston & Framingham, Mass., Street Railway Company will soon install at their power-house station a new 300-horse-power engine, with direct-connected generator, and a 150-horse-power boiler.

The Chattanooga, Tenn., Electric Railway is now engaged in rewiring their entire system. The work is now progressing mostly on the St. Elmo line, new wires being put in from Market street to Mountain Junction.

Local capitalists, represented by P. E. Sallada and A. L. Laubenstein, have applied to the Centralia, Pa., Borough Council for a franchise to build an electric railroad from Ashland to Centralia and Locust Gap.

It is reported that the Citizen's Traction Company (electric) will absorb the property of the Oshkosh horse street railway, of Milwaukee, Wis., in a few days. The horse car company has cut its price from about $50,000 to $37,000, and this sum will probably be paid. The horse car company will retain its real estate, valued at $15,000.

It is stated authoritatively that the Fairmount Park Transportation Company, of Philadelphia, has earned about $70,000 net this season. The amount is equivalent to a full year's interest on the new $500,000 bond issue and two and one-half per cent besides on the $2,000,000 capital stock. The question as to whether a small dividend will be paid has not yet been determined.

It is reported in financial circles that the Baltimore City Passenger Railway Company is negotiating, through an agent, for the purchase of the whole or a majority of the capital stock of the Baltimore, Middle River & Sparrows Point Railway Company. The negotiations are being quietly conducted, and the name of the Baltimore City Passenger Railway Company does not figure in them, though it is understood that that company will be the real purchaser should the deal be consummated. The capital stock of the Middle River company amounts to $400,000. It is owned chiefly by the Maryland Trust Company and Messrs. Alexander Brown and Henry Bowdoin. The Baltimore City Passenger Railway Company now owns the bonds of the property, having purchased them a short time ago.

PERSONAL.

Mr. Ferguson, of Cleveland, treasurer of the Walker Company, has been in the East for a brief stay.

Mr. H. A. Wagner, of the Wagner Electric Manufacturing Company, St. Louis, has been in New York for some days.

Mr. C. J. Field, formerly well known in electric railway and yachting circles, is reported to be devoting a great deal of time to a model stock farm.

President Hart, of the Hart & Hegeman Manufacturing Company, Hartford, was in New York recently on returning from Chicago and a western trip.

Mr. Frank Magee, formerly with the E. S. Greeley & Company, is holding a responsible position with the New York office of the Revere Rubber Company.

Mr. Mark A. Replogle, of the Replogle Governor Works, Akron, Ohio, visited New York city last week and made a pleasant call at the Electrical Review office.

Mr. E. L. Draffen, of New York city, formerly connected with the General Electric Company, has accepted a position with the Fort Wayne Electric Corporation.

Mr. George Walker Conover, 1511 Monadnock Building, Chicago, has succeeded Mr. J. H. Cooke as western manager for the Manhattan General Construction Company, of New York city.

Mr. Myron Knapp, a well known electrical man of Chicago, was a New York visitor last week. Mr. Knapp is one of the toilers in the electrical field who looks younger as he grows older.

Mr. S. Bergmann, the president of the General Incandescent Arc Light Company, New York, will not return from Germany, where he has been for some weeks looking after some of his interests, until nearly the end of October.

Captain W. L. Candee, of the Okonite Company, went down to Washington, D. C., last week. The absence of President McKinley was made up to him by the presence of President Samuel Bryan of the telephone company, and he returned entirely happy

Mr. E. H. Phipps, president of the Connecticut Pipe Manufacturing Company, of New Haven, Ct., has established a branch office in the Brooklyn City Railroad Building, Montague street, Brooklyn, N. Y. The underground conduit manufactured by this well known company is in such demand in the metropolitan district as to require Mr. Phipps's presence in Brooklyn several days every week.

Mr. Geo. C. Maynard, the Washington, D. C., correspondent of the Electrical Review, lost his residence by fire on September 24. The house was located near Rockville, Md., not far from Washington. The fire occurred about six o'clock in the morning and totally destroyed the building. A part of the contents was saved in a damaged condition.

Mr. J. P. McQuaide, of the National Conduit and Cable Company, will attend the Niagara Falls convention of the American Street Railway Association this month. Under the able management of Messrs. McQuaide and Perot the National company has attained an enviable success, and is one of the busiest manufacturing companies in the electrical field.

Mr. E. F. Peck, formerly superintendent of the Citizens' Electric Light Company, of Brooklyn, is the general superintendent of the Kings County Electric Light Company, of Brooklyn, probably the most important company of the kind organized in the year 1897. Mr. Peck is the right man for the work, acquainted with the territory and experienced in this special field.

Mr. A. M. Young, of Waterbury, Ct., first vice-president of the National Electric Light Association, was a brief visitor in the metropolis last week, *en route* to his Connecticut home after completing one of the most important electrical deals of the year. Mr. Young possesses the unique and most desirable credit of having organized, and is now successfully managing, over a dozen large electric lighting and electric railway enterprises, every one of which is a dividend-paying property.

ITEMS OF INTEREST.

The Kings County Electric Light and Power Company, of Brooklyn, N. Y., has filed a certificate at Albany of an increase in its capital stock from $300,000 to $2,500,000.

The Tunkhannock, Pa., Light, Heat and Power Company has awarded the contract for the erection of the electric light plant to the Scranton Electric Construction Company. The work of construction will be commenced within the next 10 days.

The two street railway companies in Cleveland, Ohio, offer to reduce fares, pay a percentage of their gross receipts into city treasury and grant a further concession in way of universal transfers. They ask that their franchises be extended so that both will expire in 25 years from date of extension. Gross of both companies last year was $2,700,000.

The applications of the four companies which propose to build electric roads to connect with the electric system of the Greene County, N. Y., Traction Company have been approved by the New York State Railroad Commission. These roads will form a through line from Coxsackie to Middleburgh, running up from Coxsackie through Greene County and the territory back of it to Middleburgh, Schoharie County. They will carry passengers and freight, and act as feeders for the West Shore Railroad at Coxsackie. John Raines, of New York city, is the attorney for the companies in which New York city capital is interested.

THE INFLUENCE OF ACCURATE MEASUREMENTS UPON ECONOMIC OPERATION.*

BY C. D. HASKINS.

Many generating stations in the early days followed a system of frequent readings of ammeters and voltmeters, basing their assumptions as to actual output on the product of coincident readings, multiplied, of course, by the time factor, thus obtaining an approximation of the kilowatt hours output per day, and therefore the approximate cost of generation per kilowatt hour.

Many, however, abandoned these frequent readings of instruments, feeling that the approximations of true output measurements were too unreliable to be of real value, because of the constant fluctuation of load between readings.

The conditions just described are in reality those of yesterday rather than to-day, and they existed only up to that time when it became possible to obtain output meters of sufficient capacity to measure in an accurate and proper manner the true output.

Electrical engineering skill has responded to the needs of the industries to which it is tributary, and standard designs now exist up to capacities as high as 8,000 amperes, whilst special instruments have been designed large enough for 16,000 amperes.

These total output meters are accurate to a high degree, not only upon steady and normal loads, but upon rapidly fluctuating loads as well, giving a true energy account of all energy output through them on loads ranging from five to six per cent of their rated capacity up to about 15 per cent above their rated capacity, the reliability of the record being unaffected with the rapidity of fluctuation of current between these points.

Important as is the measurement of the total station output, there is yet another application of positive measurements which, whilst it has long been appreciated by many, has not been applied in practice at all up to the present time, simply because the necessary meter was not available. I refer to the measurement of the energy used daily to operate each car.

Every street railway management realizes that quite a large proportion of the total energy generated is wasted by the careless and improper use of the controller and the brake, and where the old rheostat method of control is used, the opportunity for waste on the part of the motorman is yet greater.

An average drawn from the opinions which have been expressed to me would, however, indicate that no less than 20 per cent of the total energy generated is wasted by improper manipulation of the handles upon the part of the motorman; this improper manipulation being due to some extent to ignorance, but more generally to carelessness.

A meter has now been designed which will, I believe, change all of these wasteful conditions. This meter is intended for permanent installation upon the car, and its indications show accurately the consumption of energy in kilowatt hours for any desired time.

Grave difficulties surrounded the designing of a satisfactory meter for this purpose, and the perfecting of the device has only been accomplished by sustained effort extending over a long period. It was necessary not only that the meter should be accurate, under the extremely unfavorable conditions of heavy vibration and shock to which it has been exposed, but also that its construction should be of such a character as to endure these rough conditions for long periods without damage to the mechanism and without the impairment of accuracy.

Many steam railroads have long made a practice of offering annual prizes to the engine crew doing the most work with the least coal and water, and I anticipate that a similar system of reward may be found advantageous and profitable in street railway practice.

Cutting down the waste of energy 50 per cent means saving 10 per cent of the total output, and it therefore means to the street railway management either the saving of 10 per cent of the coal and water which is being used to-day, or the ability to operate 10 per cent more cars with the same central station capacity. In whichever way the matter may be viewed—whether in the light of a saving of raw material, or an increase in service without increase in expense at the station—the economy accomplished is very great, and you will all, I am sure, agree with me when I venture to assert that the influence of accurate measurement upon economic operation is of the first importance, provided proper use is made of the data thus obtained.

*Read before New York State Street Railway Convention, September 15, 1897.

Trolley Car Harems.

[*From the Cosmopolitan Magazine.*]

One of the questions that agitated Cairo last Winter was, How can the street railway company be compelled to curtain more effectually the trolley-car harems? A large part of the city, and by no means the European section exclusively, is served by a rapid transit system. The cars do not differ materially from the open cars employed on American lines, but the rear seat is reserved for women, instead of smokers, and its use is indicated by curtains that might be drawn, but in practice are not drawn, at the sides. There is no curtain in front to divide the harem from the other seats, and on an important route, like that, for example, from the Ezbekiyeh through the Boulevard Méhémet Ali to Old Cairo, the ceaseless chatter of its black-cloaked, black-veiled occupants, regardless of the silk-robed men in front and the red nightcapped hangers-on at the sides, gives a hysteric suggestion of a picnic attended by masked mourners.

Many of the solid Moslems of Cairo are disquieted by the publicity of the street-car harems, and their feelings are understood, and to some extent shared, by a few of the Anglo-Egyptians of the second and third generations. The short line of the Constantinople underground railway is more mindful of Moslem customs. The harem divisions of its cars are fully curtained; but these divisions are too small to hold the women who flock from the Galata-Pera sections during shopping hours to the bazaars of Stamboul, and there is usually an overflow in the main part of the car. No seats are provided, and the privacy of the Turkish woman, homeward bound at sunset, after a war of wits with the stately diplomats of the Oriental bargain counters, is comparable to that of the standing throng in a rush trip on a Brooklyn Bridge car.

ELECTRIC STREET RAILWAY REPAIR SHOPS.*

BY R. DUNNING.

The repairs of the electric road which operates 12 or 15 cars are, generally speaking, as varied in character as those of a much larger road, but it would be impossible for the small road to maintain a repair equipment equal to that of the large road, so much of their repair work must of necessity be done outside. But it is of the larger road which I speak. The road which operates from 100 to 400 cars.

The machine shop—with its auxiliaries, the blacksmith shop, truck shop and armature room—naturally takes precedence in repair work. The value of a convenient arrangement of these departments and the proper location in each of work benches and machinery to give full working space can not be over-estimated. To find that you can not operate your speed-drill press at times on account of work in the shaper or planer being in the way is aggravating and unprofitable. In a factory where new work is being turned out space may be economized, but in a repair shop you know not what a day may bring in to you. A good rule to observe in this matter is to take as much room as you think you will need and then double it.

A lathe equipment, consisting of one 24-inch, one 20-inch and one 10-inch speed lathe, will meet all ordinary requirements of that class of work.

The larger lathes should be provided with gib crane, fitted with differential of air pressure lifts for the safe handling of heavy work.

Two large drill presses, 22-inch and 26-inch, and one speed drill press will do the work of that department.

The other machinery may be listed about as follows:

A good milling machine (not necessarily universal).
A shaper with 18-inch stroke.
An hydraulic wheel press.
A pinion press.
A vertical wheel-boring machine.
An axle lathe.
A power shearing machine.
A power hack saw.
A power thread cutter, right and left.
A power punch.
And the necessary bending and shaping machines for sheet-iron and tin work.

The grinding work can be done with one dry and one wet grinder, a fine and coarse emery wheel, and there should also be a set of buffing wheels for finishing car and electric fittings.

A babbeting furnace and suitably arranged gas or charcoal stoves are a necessity. The air for blowing these fires may be provided by a tank and pump operated from a special pulley on the overhead shafting.

The necessary vises and hand tools must be according to the men and work, but in the matter of wrenches I prefer the solid jaw, fitted to standard nuts, to the screw or set wrench. A good arrangement with regard to tools is to have a special tool room in charge of a competent tool maker and a check system for the purpose of making the workmen responsible for tools drawn. In the armature room, besides the necessary work benches and armature stands, a binding machine, a field winding machine and bake oven are essential. A gib crane or overhead trolley with chain falls is necessary for the proper handling of armatures, and a full outfit for testing work completes this outfit.

Have system in the arrangement of work benches. Keeping the different kinds of work separate, you will thus avoid the delay and trouble of hunting for mislaid pieces.

The truck shop, besides the usual assembling tools, should have an overhead hand-power crane of from 4,000 to 6,000 pounds capacity for the safe handling of motors, etc.

The carpenter shop next claims our attention. The same rules which apply to space and arrangement in the machine shop apply here.

The following outfit of machinery will do for all ordinary work:

One planer.
One resurfacing machine.
One jointer.
One mortiser.
One boring machine.
One shaper.
One wood-turning machine.
One band saw.
One emery wheel.
One good grindstone.

A first-class man should be in charge of the machinery, who thoroughly understands the grinding and sharpening of tools.

The paint shop should be constructed so that it will have good roof light, and the width between the tracks should be sufficient to allow the work to be performed on cars standing parallel and not to crowd the workmen; in other words, the gauge lines of tracks should be between seven and eight feet, and should be of such capacity as to have the cars pass through regularly every nine or ten months.

The floor should be of concrete with a smooth surface, so that it would be easily kept clean and free from dirt, and should also be graded to be easily drained.

The power for operating the machinery can generally be best furnished by motors in each shop conveniently located, and so set up as to permit of quick substitution in case of a burn-out or break-down.

The management which has the interests of its road constantly in mind will keep ever closely in touch with the repair department. Do not be afraid of doing too much for it. The fault is generally the other way, for though it works in dirt, and as a rubbish producer is unequaled, it is but performing the vital work of renovation and removing that which is dead and is acting as a clog to the whole system.

*Read before the New York State Street Railway Convention, September 15, 1897.

Ballston Terminal Railroad.

Considerable interest is being manifested in the completion of the Ballston Terminal Railroad, at Ballston Spa, N. Y. This road has been contemplated for some time, and within the last three months, under the energetic management of Mr. J. C. Stanton, gives evidence of early completion.

The power-house, which is a commodious and substantial structure of modern ideas, is now completed. The selection of Babcock & Wilcox boilers, Hamilton-Corliss engines, Westinghouse Electric and Manufacturing Company electrical apparatus, J. G. Brill Company cars, shows wisdom on the part of the management in their selection of apparatus, the delivery of which is now going on, and the road bids fair to be fully completed before the close of next month.

The road is largely a freight road, which will handle the freight by electrical locomotives designed especially for the Ballston Terminal Railroad, and are now being erected at the car works of J. G. Brill Company, in Philadelphia. The passenger service will be taken care of by the ordinary passenger cars.

Signs of Prosperity from the Western States.

Forest City Electric Works, Cleveland, report orders increasing constantly for the protected railbond, which has proved itself to be one of the best on the market.

The Lorain & Cleveland Electric Line will probably be in operation by the first of next month, as all machinery has now been placed in position and work along the line is progressing rapidly.

The American Rheostat Company, Milwaukee, Wis., has just increased its capital stock, and extensive additions to the factory will be made at once so as to better care for the large number of orders coming in.

The Nungesser battery, put on the market by the Cleveland Electric and Manufacturing Company, has proved itself such a good seller that the company is hardly able to keep up with the orders. Increased manufacturing facilities are talked of.

D. L. Bates, Dayton, Ohio, has just passed through one of the most successful fan motor seasons and is already preparing new designs and patterns for next year's business, when the well known Bates fans will be better and more efficient than ever.

F. E. Homer & Company, Cleveland, manufacture commutators exclusively, and state that business has been good and is increasing for the better. Their commutators are made of the very best material, and, with good care and cleanliness, are outlasting anything similar on the market.

The Adams-Bagnall Electric Company, Cleveland, reports business increasing at a wonderful rate. While undoubtedly the approach of the long winter nights has some effect on the lamp trade, it is more due to the general prosperity than anything else that the orders are now so numerous, says Mr. Bagnall.

The Davis & Eagan Machine Tool Company, Cincinnati, is making a specialty of furnishing all necessary machinery and tools requisite for the manufacture, maintenance or repair of electrical machinery. The company's goods have a reputation extending over years and are much sought after by the electrical trade.

The Bullock Electric Company, Cincinnati, is doing a good business, and its direct-coupled slow-speed motors are fast becoming recognized as standard for factory equipment. Wherever these motors have replaced the old style of line shafting, a great saving in power has resulted and this saving soon pays for the cost of the equipment.

The North Electric Company, Cleveland, is getting ready a complete telephone system, with several novel improvements, and the new year will probably see the apparatus placed on the market. Mr. North is one of the pioneers in this line, and his long experience will enable him to produce thoroughly up-to-date apparatus.

The Tresher Electric Company, Dayton, Ohio, is building some large multipolar generators on orders and have work enough on hand to keep busy for some time to come. The company has been uniformly successful with the installation of its apparatus, and in many instances duplicate orders followed the initial shipment.

The Williams-Abbott Electric Company, Cleveland, is arranging with several large telephone manufacturers to supply them with all magneto bells needed. This is due to the excellent quality of the Williams-Abbott product and the fact that a concern making a specialty of such things can usually produce them the cheapest and quickest.

Manager Fish, of the Shelby Electric Company, reports orders enough on hand, so that new orders can not be filled within less than three or four weeks, until additions to factory, now in process of construction, are completed. The factory is working night and day, and the large volume of business speaks well for the high quality of the Shelby lamps.

The Fort Wayne Lamp Company, Cleveland, although slightly embarrassed by the recent fire in its hydro-carbon room, is fast catching up with its shipments of the tipless lamps, which General Manager Rogers reports meeting with an unprecedented sale. It is somewhat strange, anyway, that some people should prefer the unsightly useless tip on a lamp to the smooth, graceful bulb of the tipless Fort Wayne.

The W. H. Elliott Electric Company, Cleveland, recently completed the rewinding of a 100-kilowatt multipolar generator for the Warren Electric Company, and is especially proud of the work on account of the excellent workmanship done. The firm has been in existence some four years, Mr. C. J. Cartwright, the manager, having been in the business for over 14 years, and being the first to open an exclusively electrical repair shop in the United States.

C. E. K.

American Electric Railway Engineers in England.

[*From the London Electrician.*]

Mr. F. S. Pearson has kindly relieved the tramways committee from all embarrassment in connection with the question of his appointment as consulting engineer for the equipment of the Dingle and Princes Park routes of the local tramways. The committee has, we learn, received a communication from Mr. Pearson intimating that his numerous contracts preclude him from accepting any position under the corporation, even in a consultative capacity. It has, therefore, been unanimously agreed that the chairman and deputy chairman are to approach Dr. John Hopkinson with a view of obtaining his consent to undertake the position of consulting engineer.

The Heilmann Electric Locomotive.

[*Tecumseh Swift in the American Machinist.*]

I suppose you know something about the Heilmann locomotive. It strikes me as electricity gone daft. That is the most natural kind of a remark for an average mechanic to make about it, when he gets onto the idea. We are all more or less familiar with power transmission under different conditions. The power is running to waste or is generated at one place, and we want to use it at another. That is where the transmission comes in. Common means of power transmission are the hydraulic, the pneumatic and the electric. They have each been advantageously applied in various ways. Various other ways have been thought of, and wisely abandoned by the thinkers as impracticable. Some of them which should have been abandoned have actually got into construction first, only to come to destruction soon afterwards.

The transmission or conversion of power, of course, means loss. Whatever system is used, the nearer we are to the source of power the better we are off, other things being equal. If we can't bring our work to the water-power, for instance, why not bring the water-power to the work? Driving our cars on the railroads is the use of power that seems to trouble us most of anything. Possibly some wiseacre may have woke up some morning with a concertina headache, and with a scheme for getting rid of the loss in transmission by mounting a steam boiler on a car, the steam to drive a pump, the water from the pump to drive a waterwheel, and the waterwheel to turn the car axles and make the whole thing go. That would be an entirely self-contained system, all being mounted on the car, and there would be little or no loss in power transmission. I have, however, never heard of this scheme being proposed or mentioned before.

It might also be possible for a fellow, inflated with compressed air, to propose a similar steam boiler on a car with an air compressor and an air motor, first compressing the air on the car and then using it in the motor —the latter, of course, driving the car. This scheme, also, we never knew to be actually tried, or even proposed. I did, however, know of one compressed-air scheme not much more absurd, and had to do with furnishing the air compressor to operate it. In this scheme the compressed air at high pressure was stored on the car in suitable tanks, and in what was assumed to be sufficient quantity. There were then provided two other tanks of considerable size, one, at the start, full of oil, the other empty, and between them a liquid motor connected to the axles to drive the car. The air pressure was applied on top of the oil, and then the oil under pressure was to drive the motor and the car; the exhaust oil flowing into the second tank. When the second tank was full and the first one was empty, the air pressure was switched to the other tank, the flow of oil was reversed and the car went on. This scheme was actually worked up and tried.

Neither of these schemes is so absurd or impossible, when we stand in the presence of the third one. This is to have our steam boiler on the car, as before, the steam to drive a dynamo, the current generated to drive an electric motor, and the motor to drive the car, the same as with any trolley car of the day. This can not be as absurd as it looks, because this is the Heilmann locomotive. It has not only been made and tried, but a second and third one has been made.

The Heilmann electric locomotive is a French invention, or, rather, the inventor is a Swiss, while the invention has been developed in France. The best resources of modern engineering have been availed of in the design, and, as a whole, it is a very creditable presentation of what, to me, seems to be, after all, an utterly impracticable idea. The boiler is a good one; the engine is a Willans compound six-crank vertical engine. The supreme claim made for the engine is that everything is balanced, and that it must run smoother, especially at high speeds, than any locomotive ever before built, and must be much easier on the roadbed. There are, it seems to me, some practicable suggestions that may be made right in this line. It won't do to say anything about them to railroad men. I know how that thing works. You must only suggest the minutest possible improvements on the present locomotive, and even that is not very safe. With a few more dainty touches here and there the locomotive is perfect, and those touches, of course, should be given by those who have done all the rest of the picture.

That is all right; but I keep thinking about how much the bicycle folks have taught us all around on the general subject of locomotion, and I would not be surprised any day to see the locomotive people taking radical lessons from them about building locomotives. There is much that might be learned and adopted about the use of tubing, and why not, also, about the use of the chain? We have all of us vastly more respect for the chain as a power transmitter than we had 10 or 20 years ago. It is entirely practicable to-day to build a locomotive with high-speed, perfectly-balanced, smooth-running and economical engines and chain transmission to all the axles, and I expect to see it. With the electrical people so evidently intent upon swallowing everything in sight, it can scarcely be pretended that the time-honored old locomotive is as safe as it once was, and there was never a time when revolutionary suggestions were more permissible than now.

The Salem & Wakefield, Mass., Electric Railroad has been incorporated. The directors are: Col. Chas. F. Woodward, James F. Shaw, E. M. Southworth, W. P. Clark, Albert Mansfield, Rufus H. Brown and Oscar I. Stowell.

Opening of the Lachine Rapids Electric Plant.

On September 25 the plant of the Lachine Rapids Hydraulic and Land Company, located on the St. Lawrence River, near Montreal, was officially placed in service by the Mayor of Montreal in the presence of a large audience composed of a number of prominent men. The plant, as at present constructed, provides for installing 72 water-wheels, each of which has a capacity under a 13-foot head of 300 horse-power, giving a total of 21,600 horse-power. The head of water upon the wheels is between 15 and 16 feet, thus giving more power than was at first intended. About $1,400,000 has been invested in the plant, which has been in course of construction for more than a year. An underground conduit system has been constructed in Montreal, by means of which the current generated at the rapids will be distributed throughout the city. The transmission line between the power-house and the city of Montreal is constructed of latticed iron poles imbedded in concrete, the poles being equipped with porcelain insulators similar to those used on the Niagara Falls transmission line. The electrical apparatus has been supplied by the Canadian General Electric Company, of Peterborough, Ontario. These are of the stationary armature type with a revolving field.

The property of the Lachine Rapids Hydraulic and Land Company consists of the power-house at the rapids, and a large and valuable tract of land near by. Besides this, the company owns three substations in the city of Montreal and the complete underground conduit system mentioned above, the first to be used in Canada. The officers of the company are as follows: G. B. Burland, president; Alex. Fraser, vice-president; W. McLea Walbank, managing director. Directors, R. Wilson-Smith, S. Carsley, E. Kirke Green, Peter Lyall, W. McLea Walbank; Robert Whyte, secretary-treasurer; A. Cinq Mars, auditor; T. Pringle & Son, mechanical engineers; W. McLea Walbank, B. A., Sc., civil engineer; R. S. Kelsch, operating superintendent; John Dodds, mechanical superintendent.

Another New Gas and Electric Company in New York.

The Northern Union Gas Company, of New York city, was incorporated with the Secretary of State on September 30, with a capital stock of $1,500,000. The company will manufacture and supply gas and electricity for lighting streets and public and private buildings in the city of New York. The directors are Charles L. Horton and Edward S. Long, of New York city; J. V. H. Lawrence, of Astoria; Thomas S. Smith and I. L. Carroll, of Brooklyn.

When a smart man comes out of the little end of the horn, he turns around and blows it.—*New York Press.*

AMERICAN STREET RAILWAY ASSOCIATION.

CONVENTION RAILROAD ARRANGEMENTS.

TO THE EDITOR OF ELECTRICAL REVIEW:

The sixteenth annual meeting of this association will be held at Convention Hall, Niagara Falls, New York, October 19 to 22, inclusive. I mailed you a circular in May, giving full particulars, but thinking, perhaps, some had forgotten about the meeting, as it has been so long since you received notice, I mail you this as a reminder that we expect you to be present, as we shall be pleased to meet you, and know you will enjoy hearing the papers read which have been prepared by persons who are *up* on the subjects they have written upon. We will also have a fine exhibit of railway appliances. Every foot of space has been engaged.

Upon your arrival at the hall, leave your railroad certificate with the clerk. He will do the rest, and have it ready for you on Thursday.

Our Niagara Falls friends will have a committee to look after the ladies of our members and visitors, and will try and keep us busy enjoying the sights of their city. Headquarters of the association will be at the International Hotel, at which place the annual dinner will be given on Thursday evening, at 7.30 o'clock.

Yours very truly,

T. C. PENINGTON, Secretary.

Chicago, September 28.

The transportation committee of the association has issued the following circular:

The committee has to announce the following as the official routes account annual convention at Niagara Falls, October 19, 20, 21 and 22, 1897:

FROM THE EAST.

Special sleeping car train will leave Grand Central Station, New York, via New York Central & Hudson River Railroad at 7.30 P. M., Monday, October 18. From Boston via Boston & Albany Railroad, regular 3 P. M. train same date, connecting with special at Albany, arriving Niagara Falls 8.25 A. M., Tuesday, October 19. From Philadelphia via the Lehigh Valley (Reading Station) 7.30 P. M., arriving Niagara Falls 7.25 A. M. From Washington via Pennsylvania Railroad 7.10 P. M., Baltimore 8.25 P. M., Harrisburg 12.01 A. M., arriving Niagara Falls 10.43 next morning.

FROM THE WEST.

Michigan Central ("Niagara Falls Route"), Wabash or Lake Shore & Michigan Southern lines. Leaving Chicago via Michigan Central 3 P. M., Detroit 11.10 P. M., Monday, October 18. Leaving Chicago via Wabash Railroad 3.15 P. M., Monday, October 18. Leaving Chicago via the Lake Shore & Michigan Southern 3 P. M., Toledo 11.25 P. M., Monday, October 18. From Pittsburgh via the Pittsburgh & Lake Erie Railway 10.20 P. M. Arriving Niagara Falls early next morning.

FROM THE SOUTHWEST.

Big Four or Wabash line, leaving St. Louis via the Big Four 12 noon, Indianapolis 6.25 P. M., Cincinnati 6.30 P. M. Columbus 10 P. M., Monday, October 18, arriving Niagara Falls early next morning. Leaving St. Louis via Wabash Railroad 8.45 A. M., Monday, October 18, arriving Niagara Falls 6 48 A. M. next morning.

ARRANGEMENTS FOR TICKETS.

Special rate of fare and one-third for the round trip has been granted from points named and intermediate territory. Delegates will pay full fare one way, ask ticket agent for certificate, which, when properly countersigned at Niagara Falls, will entitle holder to a return ticket at one third fare.

The committee in charge would respectfully urge all who intend taking the Special from New York to apply as early as possible, in order that ample accommodations may be provided and proper assignment be made.

Inquiries relating to tickets, certificates and sleeping-car berths should be addressed to

Milton C. Roach, general eastern passenger agent New York Central & Hudson River Railroad Company, 413 Broadway, New York city.

J. L. White, passenger agent Boston & Albany Railroad, Washington street, Boston.

L. D. Heusner, general western passenger agent Michigan Central Railroad, Chicago.

C. K. Wilber, assistant general passenger agent Lake Shore & Michigan Southern Railway, Chicago.

W. P. Deppee, assistant general passenger agent Big Four Route, St. Louis.

J. E. Reeves, general southern agent Big Four Route, Cincinnati.

H. M. Bronson, assistant general passenger agent Big Four Route, Indianapolis.

F. A. Palmer, assistant general passenger agent Wabash Railroad, Chicago.

C. S. Crane, general passenger and ticket agent Wabash Railroad, St. Louis.

E. C. Dunnevant, city passenger agent Pittsburgh & Lake Erie Railroad, Pittsburgh, and to general or city agents' roads named at all other points

Committee: H. H. Vreeland, chairman, president Metropolitan Street Railway Company; James H. McGraw, Havemeyer Building, New York; Chas. W. Price, 41 Park Row, New York.

The special train from New York city, Monday night, October 18, is already assured of a large passenger list. Among the gentlemen who have engaged passage are the following:

Mr. James H. McGraw, Major H. C. Evans, Capt. Willard L. Candee and wife, Mr. James P. McQuaide and wife, Mr. H. L. Shippy, Mr. Charles W. Price and wife, Mr. S. H. Goddard, Mr. J. H. Carson, Mr. A. C. Shaw, Mr. George F. Porter, Mr. W. J. Clark.

The Philadelphia contingent, headed by Mr. John A. Brill and Mr. Charles A. Bragg, two very peaceable citizens, well known to the electric railway fraternity, may also be expected on the same train, as they would all rather travel by way of New York city to Niagara Falls, or to any place, than stay at home. There will be quite a Boston delegation that will join the special train at Albany.

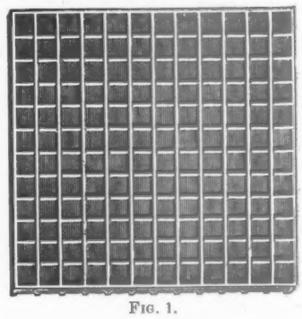

FIG. 1.

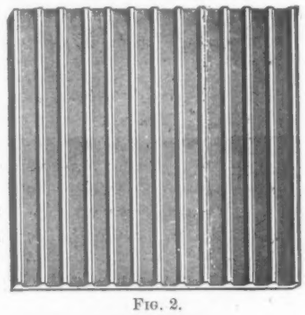

FIG. 2.

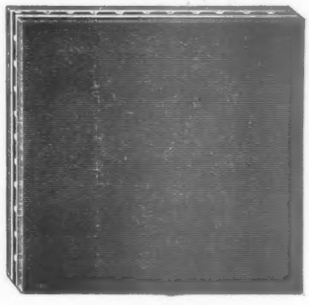

FIG. 3.

FIG. 4.

DETAILS OF THE CONSTRUCTION OF THE IMPROVED HATCH ACCUMULATOR.

Metropolitan Street Railway Company's Report.

The report of the Metropolitan Street Railway Company, of New York city, for the year ending June 30 last, shows:

Assets.	1897.	1896.	Changes.
Cost of road and equipment	$30,060,989	$30,585,536	Inc. $1,515,453
Stocks and bonds of companies	13,070,668	90,268	Inc. 12,040,415
Due from leased lines account improvements			
Supplies on hand	1,431,751	1,491,751	Inc.
Due by companies and individuals	158,091	72,604	Inc. 85,487
Cash on hand	240,831	288,079	Dec. 43,248
New construction and office furniture	295,013	448,766	Dec. 153,753
Total	666,927		Inc. 666,927
	$46,909,270	$33,782,961	Inc. 13,500,000
Liabilities.			
Capital stock	$30,000,000	$16,500,000	Inc. 13,500,000
Funded debt	9,400,000	9,400,000	
Bills payable	5,515,449	4,686,895	Inc. 909,064
Interest on fund d debt due and accrued	140,826	140,826	
Dividends unpaid; rentals account	90,565	90,565	
Due companies and individuals	609,429	691,599	Dec. 251,196
Profit and loss (surplus)	1,153,499	1,343,499	Inc. 189,991
Total	$46,909,270	$33,782,961	

The net earnings of the company during the year were considerably increased as the result of interest on investments owned by the Metropolitan Street Railway Company, but formerly paid into the treasury of the Metropolitan Traction Company, and which now goes to the former company. During the year 16 passengers were injured and two killed; two employés were injured and two killed; 19 persons not passengers or employés were injured and eight killed.

An Interesting Surgical Operation Assisted by a Radiograph.

A very interesting surgical operation, by means of which a hat pin five and one-half inches long was removed from a child's stomach, was recently performed at the German Hospital in Newark, N. J. The operation known as laparotomy was performed, and a radiograph of the child's stomach was taken to assist in locating the pin exactly. Mr. W. H. Meadowcroft, general manager of the Edison Decorative and Miniature Lamp Department, of Harrison, N.J., took the radiograph. He inclosed a regular sensitized photographic plate in a dense black envelope and then in an orange colored envelope. This was placed on the table and the child was laid on the plate. The X-ray tube was adjusted over her body and the current turned on. Two exposures were made, one of four and one-half minutes at a distance of three feet, and another of half a minute at 16 inches distance. The developed plate showed the position of the pin plainly. The head was in the child's stomach, and the pin stood upright in the æsophagus, its point only a little way from the heart. The utmost caution was required to prevent the pin from piercing the heart. With the radiograph to guide them, the physicians performed a perfectly successful operation, and the recovery of the child is expected.

The street railway employés of Chicago, at a meeting held on September 30, decided not to strike as had been contemplated.

The Improved Hatch Accumulator.

In the accompanying illustrations are shown the various details of the improved Hatch accumulator, manufactured by the Hatch Storage Battery Company, 53 State street, Boston, Mass. The officers of this company are George E. Hatch, president, and James P. Clare, treasurer. The company states that it is fully prepared to guarantee the work of this storage battery to the satisfaction of all patrons. The advantages which are claimed for it are high efficiency, light weight, durability and compactness. The counsel for the Hatch Storage Battery is Mr. Causten Browne, the well known patent attorney of Boston. Mr. Browne states that he has examined the two patents, numbered respectively 585,472 and 585,473, granted to George E. Hatch, and also patent number 337,299, granted to Charles F. Brush. Mr. Browne expresses his opinion that the Hatch batteries in no way infringe the Brush patent, which he believes is the only one in regard to which any question of infringement would be liable to arise.

The manufacturers of this battery assert that there is no new mechanical or electrical principle involved in the construction of the Hatch element. Their improvements are of a purely mechanical character and relate to the construction of the element which is practically a solid and in which the weight is reduced to the minimum amount of lead oxides required to do a given amount of work, and their mechanical support of light material. The construction and assembling of the element of the Hatch battery are shown in Figs. 1 to 5, inclusive. The basis of the element is a porous plate of unglazed earthenware, with square receptacles on its face side and grooves on its reverse side, as shown in Figs. 1 and 2. To the face side of each plate the lead oxide is applied, filling in the square receptacles so that the mass rises one-eighth of an inch above the surface of the plates. This is done in order to secure an agglomeration with the electrode during the forming process. The plates thus loaded with the active agent are placed together, back to back, with the grooves crossed, as shown in Fig. 3. This forms one couple, positive and negative, of the element.

In Fig. 4 is shown a series of these couples assembled to form the complete element, as many couples being associated as are necessary for the required capacity of the battery. The sides of this element thus assembled are flanked with a rigid support, such as a plate of glass, and then encircled with heavy rubber bands. The electrodes are then applied in any desired form, but usually in the form of lead sheets, interleaved with the active material, as shown in Fig. 5.

FIG. 5.—THE HATCH ACCUMULATOR, SHOWING ELECTRODES.

The Hatch battery, illustrated in Fig. 5 as a complete accumulator, shows how permanently the oxides are locked up, while the porosity of the entire mass is so secured that it will remain porous during the work. The elasticity of the element also allows for the expansion and contraction of the active material without closing the pores of its own mass. Provision is also made for a free circulation of the electrolyte between the plates, and at the same time allows a free escape of the gases formed by electrolysis.

The Hatch Storage Battery Company asserts that its accumulator is splendidly adapted to central station work, as no amount of current in either direction can possibly injure the element. They also state that the absolute confinement of the active material avoids deterioration by loss of that important part of the battery. The solidity of the element is urged as an advantage in traction or carriage service, as the battery is not liable to be injured by jolting. The company guarantees the maintenance of its accumulators for ten per cent per annum of their original cost when used for installations of large capacity. These batteries are also made in cabinet or portable form for use with dental tools, sewing machines, phonographs, etc. Fig. 6 is a discharge curve showing the electromotive force during the normal discharge of a 100-ampere hour element.

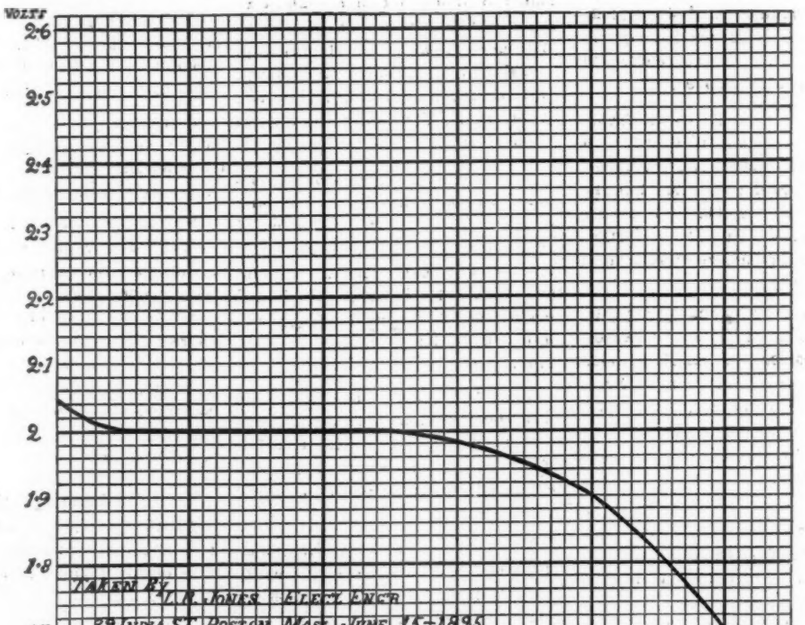

FIG. 6.—DISCHARGE CURVE OF THE HATCH ACCUMULATOR.

Tests of a Cahall Boiler.

The following is a brief abstract of a report by Geo. H. Barrus, of Boston, of tests made on a Cahall boiler, installed at the Narragansett Mills, at Fall River, Mass.:

I beg to report the results of an evaporative test on one of the 200-horse-power Cahall water-tube boilers, recently erected at your mills by Messrs. Thayer & Company, of Boston.

The boiler is one of the regular 200-horse-power size, made by this company, and set with an ordinary furnace and plain grates. The boiler contains 108 tubes, 4 inches outside diameter and 18 feet in length. The diameter of the upper drum is 6 feet 8 inches, and that of the internal flue, 34 inches. The grate is 8 feet wide and 5 feet long, with one-half-inch bars and one-half-inch air spaces. The area of the grate surface is 40 square feet, and of the water-heating surface, 2,064 square feet, the ratio of the two being 1 to 51.6. There are 50 square feet of superheating surface at the average water-line. The draft area through the flue is 6.3 square feet, or a trifle less than one sixth of the grate suface, and the space between the tubes for draft area at the entrance is about twice this quantity. The boiler is connected to the main flue of the general boiler plant by means of a rectangular branch, 22 inches by 34 inches, which drops about 6 feet at the point of entrance. The main flue is provided with a damper, which is controlled by an automatic regulator. The branch flue from the boiler is fitted with a hand damper, which is located about 6 feet from the center line of the boiler. The steam-pipe, which is eight inches in diameter, passes from the top of the boiler, horizontally, for a distance of about 15 feet, and then drops into the main steam-pipe, which connects with the engine and the general service of the mill.

For the purposes of the test the boiler was supplied with feed-water by a small steam-pump erected for the occasion, and the feed-pipe was entirely disconnected from all other pipes. The water was supplied from the city service and fed cold. For the purposes of the test it was drawn through a set of weighing tanks, in accordance with the writer's usual practice.

The test was of 10 hours' duration, being started at 7.15 o'clock in the morning and ending at 5.15 P. M. The boiler was run continuously during this period, and the test was made with a running start and finish. The difference in the condition and thickness of the fire at the beginning and end was estimated and allowed for. There was one cleaning of the fire during the test, and this occurred about one and a half hours before its close. The firing was done by Mr. Swan, an expert fireman employed by Messrs. Thayer & Company, who is familiar with the operation of the boiler. The draft was regulated by the automatic damper in the usual way, but when the rate of evaporation was too great the hand damper was partially closed. The spread system of firing was employed, and, as a rule, three shovels of coal were supplied to one door at a time. The hoe was used from time to time for leveling off the surface of the fire, and at rare intervals the slice bar was introduced and the bed of coal loosened from the bottom.

The power developed on the test was 223.4 horse-power, or about 10 per cent above the rated capacity of 200 horse-power. This was obtained with an average draft of .14 of an inch water pressure, which is far below the maximum available draft.

The evaporative result was 11.841 pounds of water from and at 212 degrees per pound of dry coal. This exceeds the guarantee of the builders (10.5 pounds of water from and at 212 degrees per pound of dry coal) 12.8 per cent.

The heat utilized by the boiler was 78.7 per cent of the total heat of combustion of the coal. Of the remaining 21.3 per cent, the gas analyses accounted for 11.8 per cent, due to the loss from the waste heat, and 2.6 per cent due to the unconsumed carbonic oxide, all of which is detailed in the table of the "heat balance." The evaporative result is unusually high for a boiler in which the flue gases escaped at the high temperature which was found in this case, but this is not inconsistent, considering the fact that the quantity of gas is unusually small, good combustion having been obtained with a very small amount of excess air.

The boiler steamed freely during the entire run without undue exertion on the part of the fireman, and there was an entire absence of fluctuation in the water-line as revealed in the gauge glass. The steam was slightly superheated at a point in the pipe a considerable distance from the boiler.

ADVANCE INFORMATION

New Electric Railways.

LANSING, MICH. — A movement is on foot to establish an electric line from Lansing, through Dansville and many intermediate towns, to Ypsilanti.

BATTLE CREEK, MICH.—Work will soon be begun on the electric road from this city to Gull Lake and Kalamazoo. It will be built from this city to Kalamazoo, passing through Augusta, Galesburg and Comstock.

CHICAGO, ILL.—The Dupage Interurban Railway Company has been incorporated by William Elmore Foster, William S. Booth, James N. Harrington and William S. Granger, of Chicago, and John A. Cook, of La Grange. The road is to run from Proviso, in Cook County, to Geneva, in Kane County. Capital stock, $100,000.

WASHINGTON, D. C.—The Capital Railway Company last week began the survey of a route for an overhead trolley electric line between Washington and Chesapeake Beach, a distance of about 25 miles. It is intended to begin the work of construction as soon as the necessary surveys are completed, to push operations all Winter, when the weather will permit, and to have the line ready for public use by April 1, if possible, by May 1 at the farthest.

TROY, N. Y.—The Catskill Electric Railway yesterday filed with the Secretary of State a certificate of a proposed extension of its road for 30 miles, from Cairo to Windham, and from Cairo in a northwesterly direction through Freehold to the northern limits of the village of Oak Hill.

SYRACUSE, N. Y.—At a special meeting of the stockholders of the Syracuse & East Side Railway Company, called for October 10, it is proposed to vote upon a proposition to increase the capital stock from $250,000 to $375,000, the additional $125,000 to be preferred. The purpose is to construct the road by running a double track line out Burnet avenue and the Thompson road, across the valley on the Denison farm and the New York Central tracks by trestle, and entering the main street of East Syracuse by Highland avenue.

PITTSBURGH, PA. — The Mount Troy & Reserve Township Electric Street Railway, which extends from Lowre and Branch streets, Troy Hill, Allegheny, three miles along the Reserve township plank road, has been opened to public traffic.

CARROLLTON, MO.—The Carrollton Electric Railroad Company has been incorporated by F. V. Crouch, J. L. Miners, F. L. O'Leary and others, with a capital stock of $10,000.

ANDERSON, IND. — The Union Electric Traction Company, headed by Congressman C. L. Henry, has placed its first order for motor cars for the Gas-Belt Electric Railway. It was for 10 double-truck, double-length, special-design cars.

Electric Light and Power.

BRIDGETON, PA. — The electric light plant here has been enlarged by an addition to the building. These additions to the plant will give capacity for at least 1,000 more lights.

CHAMBERSBURG, PA.—The borough of Chambersburg has installed a water supply plant in this city, the only corporate water supply plant operated by electricity in Pennsylvania.

RICHMOND, TEX.—Work will be begun soon on the electric plant to be established by Mr. Miller, of Houston.

SAN FRANCISCO, CAL.—The San Francisco Gas and Electric Company is erecting a building and furnishing new machinery for its new storage battery at a cost of $150,000.

WACO, TEX.—The Waco Electrical Supply and Plumbing Company has been incorporated by A. P. Moore, A. P. Duncan and J. J. Juaddell. Capital stock, $10,000.

JERSEY SHORE, PA.—The Jersey Shore Electric Company, with a capital of $10,000, has made application for a charter, which will undoubtedly be granted some time during the present week.

LA CROSSE, WIS. — The Pacific Electric Company has been awarded a contract for supplying the rubber works with an electric lighting plant, which will include a Westinghouse improved dynamo of 140 sixteen-candle-power lamps and wiring for 100 lamps. Work on the contract is to be commenced at once.

SOUTH TAYLOR, PA.—The Taylor electric light plant is about to be rebuilt at this place. A new company has been organized. The building will cost over $20,000. It is proposed to furnish light from Pittston to Scranton at a cheaper rate than is paid at present.

LEBANON, ILL.—The City Council at its session last week awarded the contract for the construction of an electric light plant to Fuller & Tritle, of St. Louis, at a cost of $7,000, and the building of the power-house to Jesse Gedney, of this city, at a cost of $1,200.

LOUISVILLE, KY.—The Board of Public Works will soon let the contract for lighting the city with electricity to the Louisville Electric Light Company at its bid of $84 per light per year. The contract will be for five years. There are now 1,225 lamps in use, and the number is constantly being added to. The city's bill for electric light is now over $100,000 a year.

DELTA, PA.—The Delta Electric Light and Power Company was awarded the contract this week for the building of four miles of line. John E. Graybill, of York, appears among the bidders.

KANSAS CITY, MO.—The electric light plant at the government building has been repaired and is again in operation. The elevator will again be tested and then it will be started.

New Telephone and Telegraph Companies.

FAYETTE, MO.—The franchise for erecting and operating a telephone exchange in this city has been awarded to J. D. Perry, of St. Louis, and C. E. Betts, of Fayette. Work has already been begun on the system. The town of Glasgow, Howard County, has let the franchise for a telephone exchange to N. W. Wickes and Henry Schnell, of that place.

HUNTINGDON, PA.—The Central Pennsylvania Telephone and Supply Company has begun the construction of a new pole line with copper metallic circuits from Huntingdon to Tyrone, and are also making their local lines to Alexandria and Petersburg metallic, equipped with long-distance telephones.

WEST GREENE, ALA.—A contract has been let for the building of a new telephone line from this place to Eutaw, connecting Epes, Gainsville, Warsaw, Velma, West Greene and Clinton with Eutaw. The work will be commenced at once.

ELWOOD, IND.—The Central Union Telephone Company has begun building a line from this town to Frankton, and will put in an exchange at Frankton.

WESTMINSTER, MD.—The Western Maryland Telephone Company, of Carroll County, has made arrangements to connect its system and give its subscribers communication with Baltimore, Frederick and Hagerstown, in this State, and with Gettysburg, Littlestown, New Oxford, Hanover, Wrightsville, York and Columbia, in Pennsylvania.

YATES, N. Y.—The Postal Telegraph company has begun the construction of a line from Geneva to Penn Yan. From the latter place the line will be extended to Watkins and thence to Ithaca. It is expected that the Penn Yan office will be opened for business some time next month.

TECUMSEH, OHIO—The new State Telephone Company is pushing work at this place and has three times as many subscribers as the old Bell company ever had. The Bell has cut rates.

RICHMOND, VA.—The Richmond Telephone Company are on the way to Manchester. Their wires are now being placed on the Free bridge, and the service of the "new" telephone will soon be extended to the merchants and citizens of this city.

ST. CLAIR, MICH.—So merry a run is the new State Telephone Company giving the Bell concern here that the old company announces a rate of $6 per year for residences, beginning October 1.

BAY CITY, MICH. — The Valley Telephone Company, the Bell's competitor in the Saginaws and Bay City, has about completed its line on the west side, and is now putting the finishing touches to the central office.

SAGINAW, MICH.—A petition was presented from the Valley Telephone Company for permission to lay conduits under the surface of certain streets named in said petition, for the purpose of placing wires and cables therein for conducting electricity for telephone purposes.

New Incorporations.

CONCORDIA, KAS.—The Corcordia Telephone Company has been incorporated; capital stock, $5,000. Directors: Geo. W. Marshall, F. J. Atwood, Frank W. Dougherty, E. A. Beslisle, G. H. Smith and J. H. Cline, all of Concordia, and E. H. Fullerton, of Jewell City.

NORFOLK, VA.—In the office of the Secretary of State last week letters of incorporation were granted to the Concord Telephone Company, with a capital stock of $1,500.

NEWARK, N. J.—Articles of incorporation of the Continental Lighting Company were recorded in the County Clerk's office to-day. The company will manufacture and sell incandescent gas-burners of all kinds, and also deal in apparatus of all kinds for supplying light, heat and power. Business will be conducted in East Orange and other places. The capital stock is placed at $100,000, and business will be commenced with $1,000. The incorporators are: Rayland Morn and George W. Mark, of New York, and Howard K. Wood, of East Orange.

JERSEY CITY, N. J.—The Electric Vehicle Company, of this place, with a capital of $10,000,000, was incorporated last week at Trenton, N. J.

CHICAGO, ILL.—E. T. Booth Company; capital, $1,000; mercantile; incorporators, Edward G. Wickoff, Virgil H. Clymer, Jared T. Neaman.

ST. LOUIS, MO. — The National Conduit and Signal Company filed articles of incorporation yesterday, with a capital stock of $250,000, all paid. H. H. McElhiney holds 1,249 shares; Benjamin Eisman, one share; B. C. Seaton, 1,248 shares; Dempster Washart, one share, and Andrew Sullivan, one share. The object of the company is to do a general electrical business.

Business Troubles.

INDIANAPOLIS, IND.—Jenney Electric Motor Manufacturing Company is reported to have given judgment for $883.

BROOKLYN, N. Y. — Amsterdam Electric Light and Power Company is reported to have given chattel mortgage for $1,000,000.

BELOIT, WIS. — Wiley-Warner Electric Company is reported to have dissolved.

HOUSTON, TEX. — The Citizens' Electric Light Company; suit brought against them by Henry Lawrence and wife, for the killing of their son, for $7,000 actual and $3,000 punitive damages.

NEW YORK, N. Y.—Judgment has been entered against the New York Electric Equipment Company by K. J. Hendricks for $51.

Kindred.... ...Interests

The Western Electric Company, Chicago, are sending out bulletins of interest to all users of starting boxes, rheostats and controllers.

A Public Exhibition was made last Thursday by the Smith-Vassar Company in Lord's Court Building, New York, of their new telephone system.

Dixon's silica graphite paint is strikingly brought to notice by means of a unique calendar blotter, just issued by the Joseph Dixon Crucible Company, Jersey City, N. J.

The Tellmic Manufacturing Company, of New Jersey, with New York offices at 89 Wall street, have recently issued an illustrated catalogue descriptive of glazed ducts for electric wires and cables.

The Reliance Works of the E. P. Allis company, of Milwaukee, Wis., have closed contracts for foreign orders aggregating $500,000. Twenty-one engines of average horse-power of 1,200 each are to be built for foreign trade.

The Edison Decorative and Miniature Lamp Department of the General Electric Company, Harrison, N. J., has issued a neat illustrated circular describing its very complete and artistic line of miniature lamps, sockets and receptacles.

A new type of switchboard, which is thought to embrace many advantageous features, was exhibited in operation at Haverhill, Mass., on Tuesday of this week. The board is one made and controlled by the Andrews-Ryan Company, telephone engineers, of Boston and New York.

J. B. Colt & Company, 115 Nassau street, New York, have perfected a hand-fed arc lamp which has all the necessary adjustments for the carbons and may be used interchangeably on different circuits, without the use of tools. This company manufacture projection apparatus for all magic lantern equipments.

Geo. W. Patterson has just been appointed Chicago and western representative for the Gordon-Burnham primary battery and the Fiberite company's Medbery switches and overhead railway appliances, with an office at No. 1114 Marquette Building. Mr. Patterson is well known to the electrical fraternity in the West.

The demand for knife-switches for motor wiring and general electric light work has increased very much of late, and knife-switches are sold in large quantities. The F. & L. motor knife-switch, handled by the Electric Appliance Company, Chicago, is one of the most desirable switches on the market in this line, being a good article at a low price. The Electric Appliance Company carry a large and complete stock of these goods and are prepared to make prices that will get the business.

The Puritan Electric Company, New York, have recently received a most unqualifiedly strong indorsement of the Puritan alternating lamp from H. F. Cottle, chief of the Electrical Construction Division for the city of Boston. The indorsements are the results of tests, made with the idea of establishing the value of the claims made by several of the companies making this type of lamp.

Mr. Fred. M. Locke, of Victor, N. Y., who has for some years made a close study of insulators for high power transmission, is prepared to furnish the various forms of insulators, including the triple petticoat, china and glass insulators, for transmission up to 50,000 volts, in any quantities. Mr. Locke also informs the editor of the ELECTRICAL REVIEW that a patent is being issued which covers the broad insulator of the Niagara type.

The Electric Appliance Company, of Chicago, have just issued a new circular on the "Midget" Upton long-burning arc lamp, giving a complete description of the lamp in the various styles and types, together with illustrations of complete lamps and the working mechanism. The Electric Appliance Company report that the "Midget" long-burning lamp is one of their most satisfactory specialties, as it sells on sight and always gives good results. In construction it is one of the simplest arc lamps on the market to-day, and in this lamp, at least, simplicity of construction means satisfactory operation. The Electric Appliance Company would be glad to send their new circular and make prices on application.

ELECTRIC LIGHT FLASHES.

The directors of the Pennsylvania Heat, Light and Power Company, of Philadelphia, have declared dividends of 50 cents per share on the common and $1.50 per share on the preferred stocks.

The Edison Illuminating Company, of St. Louis, has been reorganized as the Missouri Electric Company, with $4,000,000 capital stock. Before the reorganization the capital was $8,000,000.

The Edison Electric Illuminating Company of New York has declared its usual quarterly dividend of one and one-half per cent, payable November 1. Books close October 9 and reopen November 3.

Mechanical Draughtsman Wants Situation.

A well educated young man, who has been a year with the General Electric Company, desires position as mechanical draughtsman. Address

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Care ELECTRICAL REVIEW.

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WORKS, PERTH AMBOY, N. J.
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Creosoted Lumber, Underground Conduits, Telegraph Poles, Piling and Ties Furnished.

$7,800 GIVEN AWAY
To persons making the greatest number of words out of the phrase "Patent Attorney Wedderburn." For full particulars, write the National Recorder, Washington, D. C., for sample copy containing same.

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Incorporated,
ENGINEERS, CONTRACTORS.
Successors to White-Crosby Company, and J. G. White & Co.,
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IMPROVED AND NOW PERFECT.
THE "ESPERSEN ADJUSTABLE SHADE LAMPS."
Made in ten different styles and colors to suit purchaser. Write for Discounts and Catalogue "D." Good Agents wanted in the U. S. and Europe.
PACIFIC ELECTRIC CO.,
120 Main Street, La Crosse, Wis.

EVERY SATURDAY TOURIST SLEEPING CAR ROUTE TO CALIFORNIA.

Commencing next Saturday night, and continuing every Saturday night thereafter, Midland Route tourist cars en route to Colorado, Utah and California will leave the Chicago Union Passenger Station of the Chicago Milwaukee & St. Paul Railway at 10 o'clock, running over the Chicago and Omaha Short Line to Omaha, thence via Lincoln, Neb., Colorado Springs and Leadville, Colo., Salt Lake City and Ogden, Utah, Reno, Nevada, and Sacramento, Cal., arriving at San Francisco at 8.45 P. M. Wednesday.

As will be noticed, this route is midland through northern Illinois, Iowa, Nebraska, Kansas, Colorado (through the heart of the Rockies), Utah, Nevada and California, affording a perfect panoramic view of prairie, mountain and coast scenery.

These popular every Saturday California excursions for both first and second-class passengers (not foreign emigrants) are "personally conducted" by intelligent, competent and courteous "couriers," who will attend to the wants of all passengers en route. This is an entirely new feature of tourist-car service, and will be greatly appreciated by families or parties of friends traveling together or by ladies traveling alone. Particular attention is paid to the care of children, who usually get weary on a long journey.

Remember that the Midland Route Tourist Cars are sleeping cars, and are supplied with all the accessories necessary to make the journey comfortable and pleasant, and the sleeping berth rate is but $6 (for two persons) from Chicago to California.

Ask the nearest ticket agent for a tourist-car "folder," giving complete information about the Midland Route, or address "Eastern Manager Midland Route," No. 95 Adams street, Chicago, Ill., or Geo. H. Heafford, General Passenger Agent, 410 Old Colony Building, Chicago.

P. S.—Berth reservations are made in the order received up to each Saturday morning. First come, first served.

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in New York City is
Far-reaching,
covering forty square miles and 20,000 stations;
Efficient,
the service never stops night or day, and the speed of operating is high;
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20 YEARS, NOT CHEAP BUT SERVICEABLE AND FULLY GUARANTEED.
CIRCULARS FURNISHED.
VIADUCT ELECTRIC Co.
BALTIMORE, MD., U. S. A.

The Mayor and Gas Committee will receive bids to light the City of Waco, on an all-night and also on a moonlight schedule, with 125 to 200 arc lights, 2,000 c.-p., for a term of two to five years. We will also receive bids to install an electric light plant, specifications for which will be furnished by City Engineer on demand. All bids must be accompanied by a $1,000 certified check. We reserve the right to reject any or all bids. The bids will be opened by the Mayor and Gas Committee at 3 P. M., October 7th, 1897.

C. C. MCCULLOCH,
Mayor, Waco, Texas.

ATTEST:
R. W. JOBLONOWSKI,
City Secretary.

MAKING SWITCHES OUR SPECIALTY
Write for full particulars, free Samples, etc. A new brand—Pioneer
SWITCHES
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IN GLASS OR PORCELAIN.
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Victor, N. Y.

TRACK BONDING: HOW CAN WE OBTAIN THE BEST RESULTS.*

BY H. C. NEWTON.

To obtain the best results a rail joint should have an equal or better—a greater—current-carrying capacity than the body of the rail itself. We have all heard this theory advanced before, but we are all bound to acknowledge that we have never seen it put in practice, without it was on a new piece of electricity-welded track, on which the joints had not had time to break. Yet every city has portions of track through which a congestion of traffic and a consequent piling up of cars is forcing such a volume of current as to lead to serious power losses therein. The engineer will possibly remember of specifying a four-nought copper bond at the time the last piece of nine-inch girder was laid in the congested district, and of congratulating himself on thus getting what he thought was a first-class job of bonding. And yet, when he comes to consider that the rail has probably nine times the current-carrying capacity of the bond itself, and the bond is only riveted or upset in some way in the hole in the rail, and instead of having six times its cross-sectional area in contact with the steel of the rail it has possibly two, he will perceive that there is some reason to doubt whether he has such a first-class job after all.

A waterworks system which was so laid out that 10 per cent of the power at the station was spent in overcoming friction in the mains would not be regarded with much favor. On the same principle, a street railway system on which a similar percentage of the power is lost in the rail should hardly be considered as a perfect example of electric railroad practice. Yet I will venture the assertion that there are not more than a score of roads in the United States to-day that can prove a more satisfactory condition of affairs. The trolley feeder systems are carefully calculated, but the rail is bonded, how little or how well is immaterial; the ground will take care of what slops over.

With all due deference to the ideas of the track man, whose greatest glory is in a perfect roadbed, and to those of the electrical engineer, whose hobby is a complete trolley feeder system with a theoretical loss of five per cent, I must yet insist on the importance of the rail return. Down in Syracuse we use the soldered bond with no track feeders on the permanent way. The bonding is of 0000 capacity and double throughout. The congested district of the city, the common center, is not (as it should be) bonded to equal the capacity of the rail section. Our financial backing has not been educated to that extent as yet, and would regard such an outlay as extravagance. The whole track, however, is in such a condition, where the above-named bond has been used, that a low-reading voltmeter has failed at any time to detect a difference of potential between water-pipes and rail, and the Western Union Telegraph Company, with its keen nose for electrolytic action, has been unable to locate a drop between their lead-covered return and the iron of the rail, the attempt being made with an instrument reading to 1-100th of a volt.

The importance of a true metallic return can not be overestimated. Where the chance for corrosion between band and rail is allowed to remain, the certainty of an interrupted contact one day is assured. The jar produced at the joint by the impact of the car wheels results in vibration enough to loosen fish-plate bolts, and in the natural course of events must loosen rivets as well.

The rail should be one mass of continuous metal throughout, to give permanency of electrical contact. It must therefore be homogeneous. To make it so some process of brazing or soldering must be adopted. The former process has been found impracticable, except in cases where it is possible to take advantage of wilding currents, or return currents of immense volume. These can be obtained ordinarily only at the power station, or by a large expenditure for special wilding apparatus.

With these considerations in view, the conclusion is forced upon us that the really practicable process is to solder the bond to the rail. Experience has proven it economical in first cost, and most desirable in the character of the results obtained.

*Read before the New York State Street Railway Convention, September 14.

At the last meeting of the Village Commissioners of Hackensack, N. J., a resolution was passed in favor of the Union Traction Company being given a franchise through the village, the commissioners naming $20,000 as the price to be paid by the company.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED SEPTEMBER 28, 1897.

590,633 Telephone system and telephone exchange mechanism; H. P. Snow, Erie, Pa.

590,648 Recording wattmeter; W. H. Pratt, Lynn, Mass.—Consists of an astatic motor mechanism comprising more than a single armature winding or section of winding, which respectively acts under the influence of magnetism in opposite directions to rotate the shaft in the same direction, and a danting mechanism.

590,650 Alternating-current meter; R. Shand, Lynn, Mass.—Consists of a current coil, a potential coil, a transformer whose primary is coupled across the circuit mains, and a third coil in the secondary circuit of the transformer, all said coils being in inductive relation to the rotating armature.

590,653 Shielding device for electric meters; E. Thomson, Swampscott, Mass.—Consists of an armature, field or load coils, a magnetic danting mechanism and a copper or like shield forming the seat of induced current surrounding the field coil or coils.

590,654 Electric measuring instrument; E. Thomson, Swampscott, Mass.

590,664 Printing telegraph; R. Kubler, Berlin, Germany.

590,673 Process of and apparatus for electrically treating ores.

590,725 Electric arc lamp; H. Leitner, London, England.

590,750 Safety fuse for electrical devices; D. J. Cartwright, Boston, Mass.

590,930 Secondary battery; M. de Contades, Paris, France.

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THE ANNUAL MEETING OF STOCKHOLDERS of the ELECTRICAL REVIEW Publishing Company will be held on Saturday, October 9, 1897, at two o'clock P. M., at the offices of the company, 41 Park row, New York city, for the Election of Directors for the ensuing year, and for the transaction of such other business as may come before the meeting.

New York, September 28, 1897.

STEPHEN L. COLES, Secretary.

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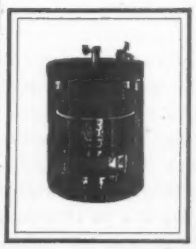

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